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ALBERTA

ENERGY RESOURCES CONSERVATION BOARD

DECISIONS

1981

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Decisions that are missing #8, 14, 23, & 30

81-1	800319	GAS PROCESSING PLANT - ROBB-HANLAN AREA GULF CANADA RESOURCES INC.	22 JANUARY 1981
81-2	790732	ENHANCED RECOVERY BY ETHANE ENRICHED MISCIBLE FLOOD - CAROLINE VIKING A POOL DOME PETROLEUM LIMITED	27 FEBRUARY 1981
81-3	800530 AND 800733	STYRENE MONOMER PRODUCTION ALBERTA ENERGY/ESSO CHEMICAL SHELL/NOVA	23 FEBRUARY 1981
81-4	800795 AND 800796	LICENCES TO DRILL WELLS - WEMBLEY FIELD DOME PETROLEUM LIMITED	20 FEBRUARY 1981
81-5	800163	ENHANCED RECOVERY - WESTPEM NISKU A CHEVRON STANDARD LIMITED	31 MARCH 1981
81-6	800276	ALTERNATIVE COOLING STUDIES - WABAMUN POWER PLANT	28 APRIL 1981
81-7	800561, 800562, 800741, 800742, 800806, 800807 AND 800897	PERMITS TO CONSTRUCT PIPELINES AND RELATED FACILITIES - LLOYDMINSTER AND COLD LAKE EDMONTON AND COLD LAKE ALGAS ENGINEERING SERVICES LTD. ALBERTA ENERGY COMPANY LTD.	3 APRIL 1981
81-8	810047 missing	EXTENSION OF SERVICE AREA THE CITY OF MEDICINE HAT	9 APRIL 1981
81-9	810172	LICENCE TO DRILL A WELL IN THE PARADISE FIELD DOME PETROLEUM LIMITED	11 JUNE 1981

DECISIONS

NUMBER	APPLICATION NUMBER	TITLE	DATE OF ISSUE
81-10	800853	INDUSTRIAL DEVELOPMENT PERMIT TO MANUFACTURE ETHYLENE THE ALBERTA GAS ETHYLENE COMPANY LTD.	26 JUNE 1981
81-11	800934	TO REINSTATE WELL LICENCE NOS. 85532 AND 85632 - ROCKYFORD AREA WESTERN DECALTA PETROLEUM (1977) LIMITED	5 JUNE 1981
81-12	801022	GAS PROCESSING PLANT - MORLEY-GHOST RIVER AREA PHILLIPS PETROLEUM COMPANY WESTERN HEMISPHERE	26 JUNE 1981
81-13	800939	COMMON PURCHASER, CARRIER, AND PROCESSOR - OKOTOKS CROSSFIELD POOL CANADIAN OCCIDENTAL PETROLEUM LTD. ET AL	12 JUNE 1981
81-14	800969 missing	COMMON PROCESSOR OF GAS - WESTEROSE SOUTH GLAUCONITIC A POOL - AN UNDEFINED BASAL QUARTZ SANDSTONE POOL IN THE WELL, SUNDANCE ET AL LENNOX 7-5-45-2 SUNDANCE OIL CANADA LTD.	12 JUNE 1981
81-15	810196	REINSTATE WELL LICENCES NO. 88870 AND 89046 DOME PETROLEUM LIMITED	8 JULY 1981
81-16	800910	INDUSTRIAL DEVELOPMENT PERMIT TO MANUFACTURE POLYETHYLENE NOVA, AN ALBERTA CORPORATION AND SHELL CANADA LIMITED	17 JULY 1981
81-17	801017	INDUSTRIAL DEVELOPMENT PERMIT TO MANUFACTURE POLYETHYLENE ALBERTA ENERGY COMPANY LTD. AND DU PONT CANADA INC.	31 AUGUST 1981
81-18	810346 AND 810347	REINSTATE WELL LICENCE NO. 88984 AND LICENCE TO DRILL A WELL, DOME ET AL LINDBERGH 7A-7-56-6 W4M - LINDBERGH FIELD DOME PETROLEUM LIMITED	24 JULY 1981

NUMBER	APPLICATION NUMBER	TITLE	DATE OF ISSUE
81-19	800741, 800742 AND 800883	PERMITS TO CONSTRUCT PIPELINES AND RELATED FACILITIES - EDMONTON-SKARO AREA ALBERTA ENERGY COMPANY LTD. SHELL CANADA LIMITED	5 AUGUST 1981
81-20	PROC. 810078	DRILLING SPACING UNIT TARGET-AREA REQUIREMENTS FOR OIL AND GAS WELLS - PROVINCE OF ALBERTA UNIFARM SMOKY RIVER SURFACE RIGHTS SOCIETY BONANZA AND DISTRICTS SURFACE RIGHTS ASSSOCIATION	4 AUGUST 1981
81-21	PROC. 810078	DRILLING SPACING UNIT TARGET-AREA REQUIREMENTS FOR OIL AND GAS WELLS - MUNICIPAL DISTRICT OF SMOKY RIVER AND BONANZA AREA SMOKY RIVER SURFACE RIGHTS SOCIETY BONANZA AND DISTRICTS SURFACE RIGHTS ASSOCIATION	4 AUGUST 1981
81-22	800908	INDUSTRIAL DEVELOPMENT PERMIT TO MANUFACTURE POLYETHYLENE C-I-L INC. AND TRIMAC LTD.	7 AUGUST 1981
81-23	810416 missing	DOME LINDBERGH EXPERIMENTAL SCHEME DOME PETROLEUM LIMITED	10 SEPTEMBER 1981
81-24	800889	INDUSTRIAL DEVELOPMENT PERMIT TO MANUFACTURE ETHYLENE GLYCOL UNION CARBIDE CANADA LIMITED	21 SEPTEMBER 1981
81-25	810147 AND 810395	LICENCE TO DRILL A WELL SPECIAL DRILLING SPACING UNITS DOME PETROLEUM LIMITED RODNEY AND LINDA ELVESTAD	25 SEPTEMBER 1981
81-26	801010 PROC. 810132	REDUCED SPACING AND TARGET AREA REQUIREMENTS - LINDBERGH AREA DOME PETROLEUM LIMITED	13 OCTOBER 1981

DECISIONS

NUMBER	APPLICATION NUMBER	TITLE	DATE OF ISSUE
81-27	810487	SECONDARY NATURAL GAS LINES AND REGULATOR FACILITIES - CALGARY - PRIDDIS AREAS CANADIAN WESTERN NATURAL GAS COMPANY LIMITED	28 OCTOBER 1981
81-28	810535	INDUSTRIAL DEVELOPMENT PERMIT TO MANUFACTURE ACETIC ACID AND VINYL ACETATE MONOMER CELANESE CANADA INC.	26 NOVEMBER 1981
81-29	PROC. 810385	NORTHEAST EDMONTON PIPELINE CORRIDOR INQUIRY	27 OCTOBER 1981
81-30	810258 AND 810425	EXTENSION TO SERVICE AREAS - WINEFRED LAKE AREA TRANSALTA UTILITIES CORPORATION ALBERTA POWER LIMITED	24 NOVEMBER 1981
81-31	810759	PERMIT TO CONSTRUCT SEGMENTS OF A PIPELINE NEAR CALGARY AND LEDUC ALBERTA PRODUCTS PIPE LINE LTD.	24 NOVEMBER 1981
81-32	810690	REINSTATE WELL LICENCE NO. 90345 - HOLMBERG FIELD PANTHER RESOURCES LTD	24 NOVEMBER 1981
81-33	810600	PERMIT TO CONSTRUCT THE LIEGE LATERAL AND METER STATION NOVA, AN ALBERTA CORPORATION	10 DECEMBER 1981
81-34	810460, 810461, 810462 AND 810513	PERMIT TO CONSTRUCT DEFERRED PORTIONS OF A PIPELINE - EDMONTON TO CALGARY ALBERTA PRODUCTS PIPE LINE LTD.	16 DECEMBER 1981
81-35		NOT ISSUED	
81-36	810418	GAS PROCESSING PLANT - BRAZEAU RIVER FIELD HUDSON'S BAY OIL AND GAS COMPANY LIMITED	23 DECEMBER 1981

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

Interim Decision
Application 801010
Proceeding 810132

DOME - LINDBERGH WELL SPACING

INTRODUCTION

The Board received an application from Dome Petroleum Limited (Dome) requesting 40-acre (16-hectare) spacing for the area shown on Figure 1 and referred to as "the Lindbergh area". At the hearing, Dome amended its application to indicate that the target area it was seeking was in the south-east corner of the legal subdivision as recommended by the Board staff and as shown on Figure 2.

The Board staff filed a submission recommending that if the Dome application was approved, the lands, as shown on Figure 1 but not included in the application, should also have south-east corner target areas on 160-acre (64-ha) spacing so as to be consistent with the Dome lands.

The Board held a public hearing into these matters June 16 to 18, 1981 at Lloydminster with G. J. DeSorcy, P.Eng., C. J. Goodman, P.Eng., and N. A. Strom, P.Eng., sitting. A number of farm groups intervened at the hearing.

INTERIM DECISION

Drilling and production in the Lindbergh area have indicated widespread occurrences of heavy oil in the Cretaceous sands. The development of this heavy oil resource will require relatively close well spacing in order to recover this high viscosity crude oil. At the Lloydminster hearing there appeared to be general acceptance by the Elk Point Surface Rights Association, Highway 14 East Surface Rights Group, and North East Alberta Protective Rights Association, the principal farm groups appearing at the hearing, that 40-acre (16-ha) well spacing as proposed by Dome was appropriate for the area. For the above reasons the Board has decided to approve 40-acre (16-ha) well spacing in the area applied for by Dome and shown in Figure 1.

With respect to the appropriate target area within the lands where 40-acre (16-ha) spacing is to be in effect, the Board notes that Dome applied for a south-east target area as shown on Figure 2. The farm groups, and particularly the Elk Point Surface Rights Association, subscribed to the concept of a south-east corner target area for three out of four of the 40-acre (16-ha) blocks within a quarter section, but suggested that the target area should be larger and should go to the fence line. The target areas as suggested by the farm groups are shown on Figure 3.

The Board agrees that a corner target area is more desirable with respect to impact on the surface, and in particular as it relates to access roads; and notes that both Dome and the farm groups favoured this idea. However, the Board is aware from the hearing that the interior target location in the north-west quadrant of each quarter section was disputed. Dome proposed a continuance of the south-east corner targets whereas the farm groups, particularly the Elk Point Surface Rights Association, suggested a target area in the south-west corner of the 40-acre (16-ha) block. It referred to the possibility of directional drilling to complete a well in the south-east corner, thus accomplishing uniform sub-surface target spacing. While the Board recognizes the general nature of the opposing positions taken respecting Dome's proposed interior target location, the matter requires considerably more deliberation before a decision can be made.

With the exception of the problem of the target location for the north-west 40-acre (16-ha) quadrant, the Board is satisfied that locating well sites in the south-east corners of the other three 40-acre (16-ha) quadrants would directly or indirectly assist both the agricultural and petroleum industries in carrying out their own operations. Therefore, in order to expedite orderly oil well development in the area and avoid uncertainties in the immediate future, the Board has decided to approve the full 10-acre (4-ha) target areas for the north-east, south-east, and south-west quadrants of each quarter section, as shown in Figure 4. In its later detailed report, the Board will deal with the matter of the interior target location of the north-west quadrant of each quarter section.

With respect to the areas, shown on Figure 1, that would not be operated by Dome and hence were not part of its application, the Board agrees with its staff that the target area for the prevailing 160-acre (64-ha) spacing should be shifted to be consistent with the target area now approved for the 40-acre (16-ha) spacing. Accordingly, the Board approves for the area shown in white on Figure 1, where 160-acre (64-ha) spacing units continue, a target area composed of 10-acres (4-ha) in the south-east corner of each quarter section as shown in Figure 5.

The Board will be issuing the necessary spacing orders shortly. It will also issue within the next few months a further report giving its reasons for the above-noted decisions in greater detail, and its decision on the deferred matter.

DATED at Calgary, Alberta, on 6 July 1981.

GJ DeSorcy

G. J. DeSorcy, P.Eng.
Vice Chairman

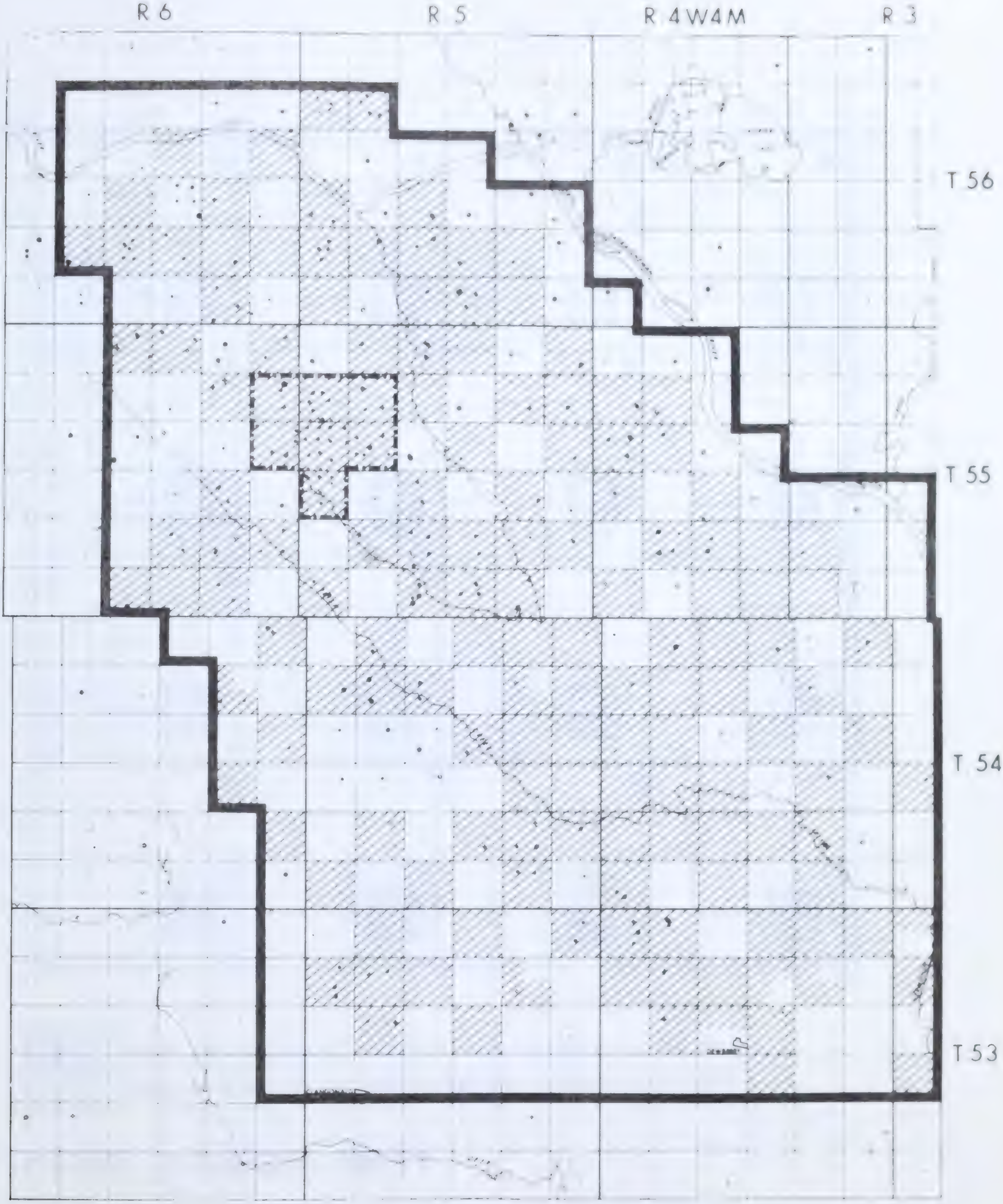
C. J. Goodman

C. J. Goodman, P.Eng.

N Strom

N. Strom, P.Eng.

ef



LINDBERGH AREA

— · — ORDER NO. SU 1058

▬ STAFF SUBMISSION GENERAL AREA

▨ DOME OPERATED LAND FOR WHICH THE 40 ACRE SPACING WAS REQUESTED

FIGURE 1 AREA OF APPLICATION.

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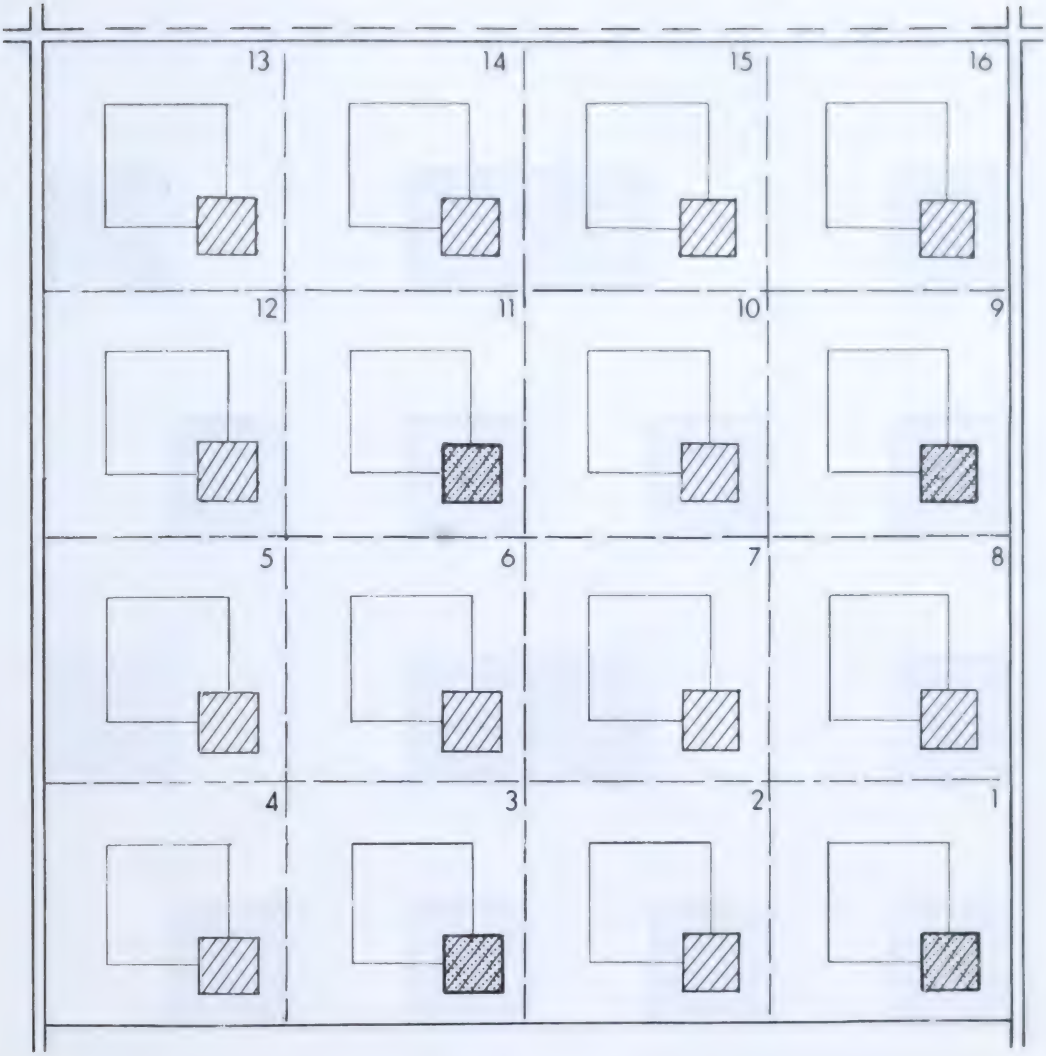
ALBERTA CANADA



▩ TARGET AREA PROPOSED BY BOARD STAFF FOR 160 ACRE (64 ha) SPACING.

▨ TARGET AREA PROPOSED BY DOME FOR USE WITH 40 ACRE (16 ha) SPACING

FIGURE 2 TARGET AREAS

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA CANADA

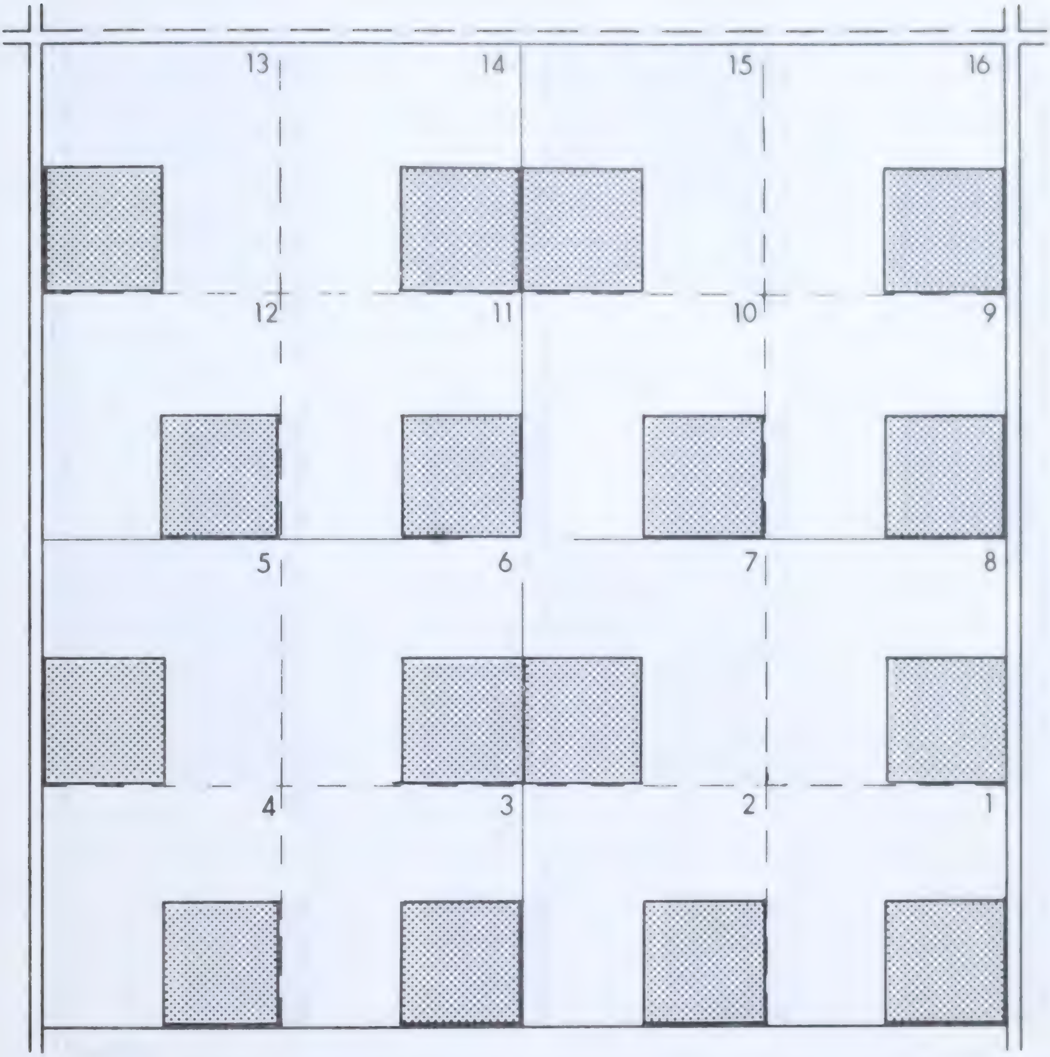
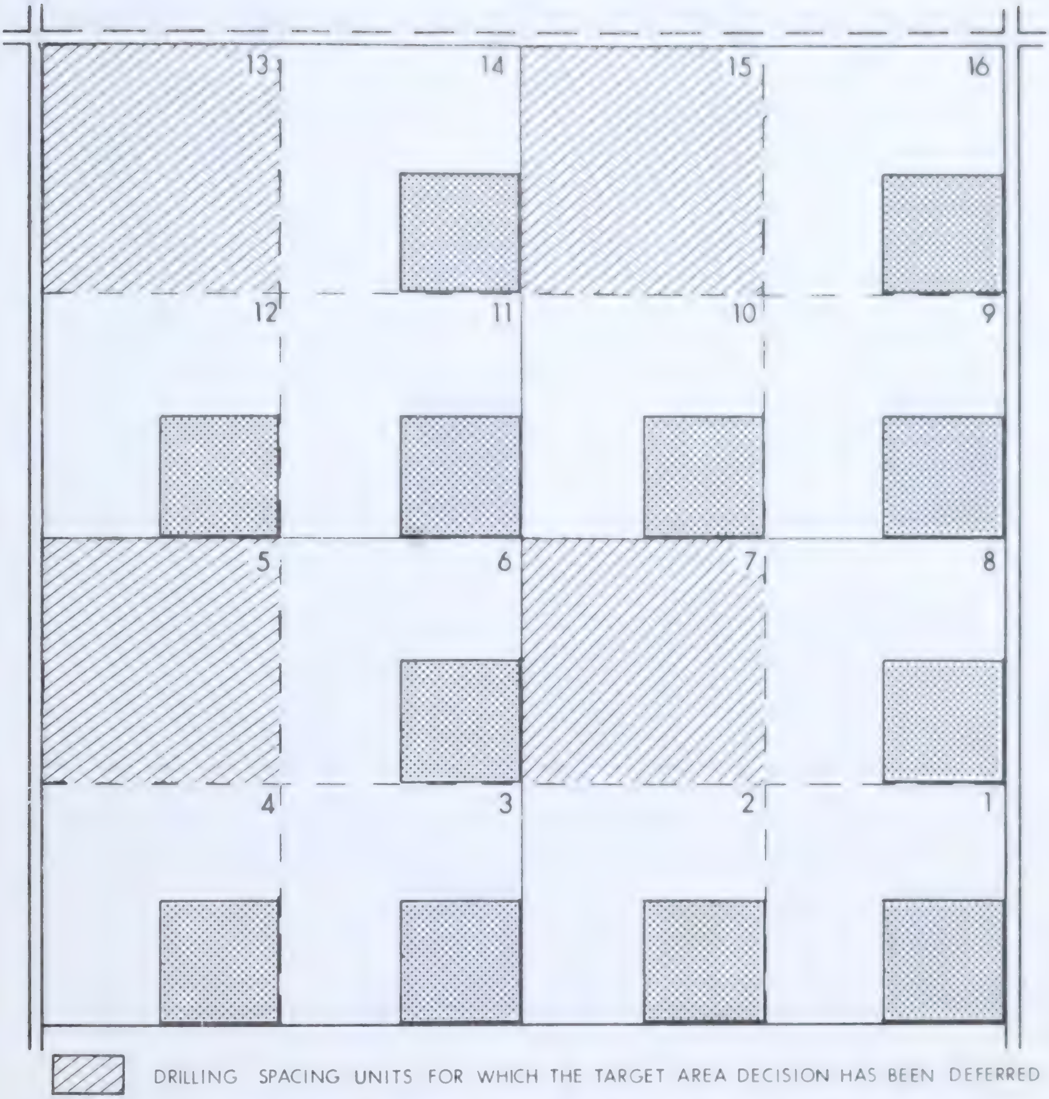


FIGURE 3 TARGET AREAS PROPOSED BY ELK POINT SURFACE RIGHTS ASSOCIATION FOR 40 ACRE (16ha) DRILLING SPACING UNITS IN ONE SECTION.

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA CANADA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DRILLING SPACING UNITS FOR WHICH THE TARGET AREA DECISION HAS BEEN DEFERRED

FIGURE 4 BOARD APPROVED TARGET AREAS FOR 40 ACRE (16ha) DRILLING SPACING UNITS.

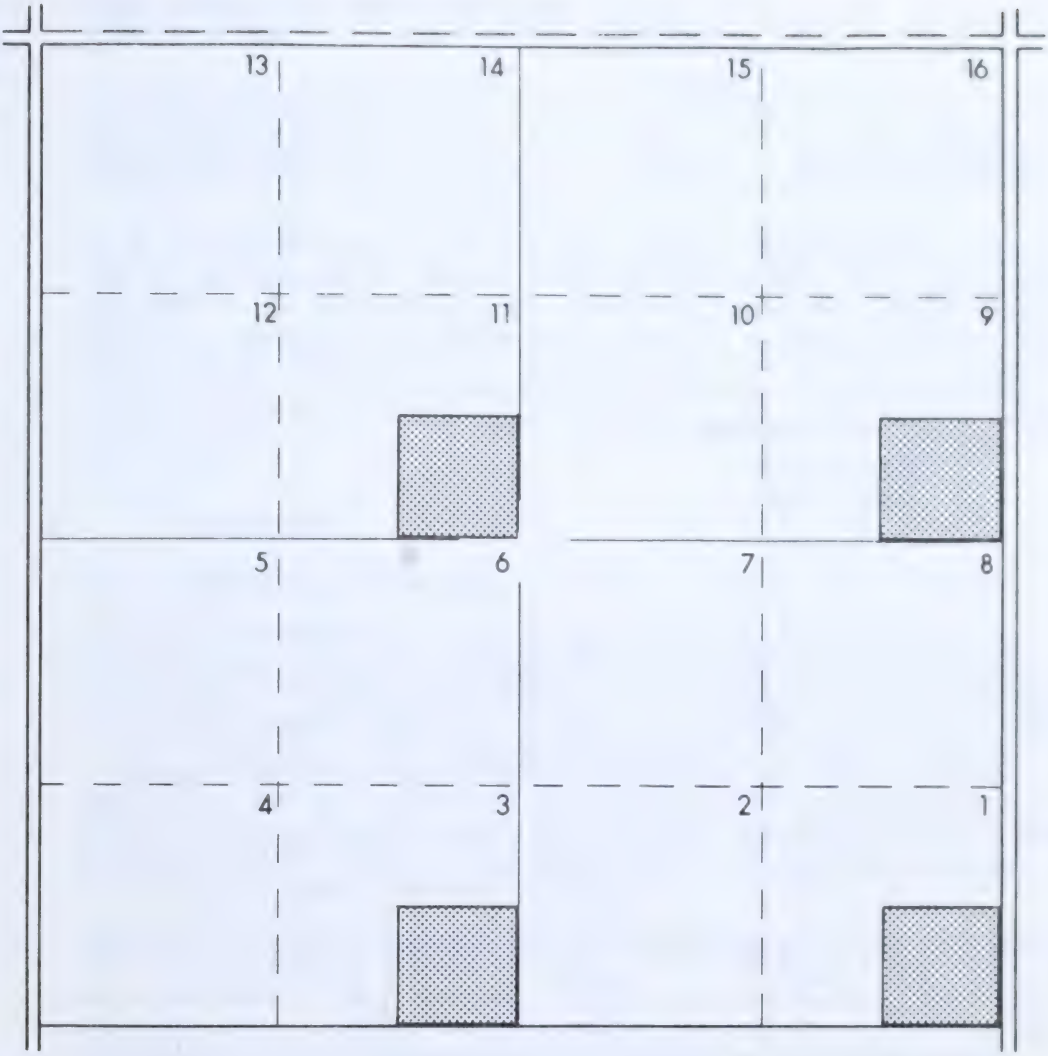

FIGURE 5 BOARD APPROVED TARGET AREAS FOR 160 ACRE (64 ha) DRILLING SPACING UNITS.

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

GULF CANADA RESOURCES INC.
GAS PROCESSING PLANT
ROBB-HANLAN AREA

Decision 81-1
Application 800319

In an interim decision report dated 21 November 1980, the Board indicated that it was prepared to approve an application by Gulf for a gas processing plant in the Robb-Hanlan Area. The Board issued the interim report because it recognized the importance to Gulf of an early decision. This related to the need for Gulf to negotiate with coal and timber operators in the area of the project respecting the location of gathering lines and field facilities. This report presents in detail the Board's reasons for decision.

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1 INTRODUCTION

1.1 Application and Hearing

Gulf Canada Resources Inc. applied, pursuant to section 38 of The Oil and Gas Conservation Act, for approval of a scheme for the processing of sour gas in a plant to be located in the northeast quarter of section 2, and the southeast quarter of section 10, township 49, range 20, west of the 5th meridian. The proposed plant would be designed to process a maximum of 8.452 million cubic metres (10^6 m^3) per day of sour raw gas from which 6.721 x 10^6 m^3 of sales gas, 13.3 m^3 of pentanes plus, and 1147 tonnes of sulphur would be recovered. A maximum of 34.8 tonnes per day of sulphur dioxide would be emitted to the atmosphere through an incinerator stack 61 metres in height.

The application was considered at a public hearing on 12 and 13 November 1980 in Edson with G. J. DeSorcy, P.Eng., C. J. Goodman, P.Eng., and E. E. Kupchanko, P.Eng., sitting. In its notice of hearing, the Board indicated that in conjunction with hearing the specific application for approval of the gas processing plant, it would hear representations respecting the impacts of the entire project, including the proposed plant, gas gathering system, field production facilities, and railway. The impacts related to the proposed routing of gas gathering pipelines were discussed at the hearing, but the technical details and impacts of the pipelines and other facilities for which Board approval is still required will be considered at a later date upon receipt of the appropriate applications.

The location of the proposed plant and the tentative pipeline gathering system are shown on the attached Figure 1 along with towns, villages, and other major landmarks.

1.2 Interventions

The Board received interventions from a number of coal and timber leaseholders in the area of the proposed project, who were concerned about the potential impact of the wells, field facilities, and pipelines on their present and future operations. None of the interveners who appeared at the hearing was opposed to the proposed processing plant. The Board did receive letters from N. Chapman and J. Brandrick which expressed some concerns respecting the proposed plant, however, neither party was represented at the hearing.

A list of those who appeared at the hearing is given in Table 1-1.

1.3 Issues

The issues raised by the application are:

- need for a new plant in the area
- technical and conservation aspects of the proposed plant
- environmental impact of the proposed plant
- social and economic impact of the proposed plant on the area and the province
- impact on coal resource owners
- impact on timber resource owners
- proposed plant location

2 NEED FOR A NEW PLANT IN THE AREA

Gulf, on behalf of the partners in the project, proposed to install facilities to produce, gather, and process sour gas from several pools in the area. Gulf stated that the plant was required to condition the gas by removing acid gas (hydrogen sulphide and carbon dioxide), water, and hydrocarbon liquids from the raw sour gas to meet pipeline specifications.

Gulf indicated that an alternative two-plant concept was considered but was less desirable than one plant because, although the gas gathering system would be substantially reduced with accompanying reductions in pipeline cost and environmental disturbance, plant capital and operating costs would increase and plant-related environmental disturbance would essentially double.

Gulf considered the alternatives of delivering the gas in the area to an existing plant near Edson operated by Hudson's Bay Oil and Gas Company Limited or to an existing Gulf-operated plant near Rimbey. Gulf contended that, while both existing plants have spare processing capacity, neither could handle the proposed project's total volume. Gulf added that major additions or modifications in the treating sections and sulphur plants of both existing plants would be required

TABLE 1-1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Gulf Canada Resources Inc. (Gulf) J. D. Anderson J. Nozick	J. C. Stamberg, P.Eng. J. A. Lau, P.Eng. G. O. Earl, P.Eng. M. Strong R. Webb
Denison Mines Limited (Denison) L. Sali	R. S. Sagi, P.Geol.
Luscar Ltd. (Luscar) G. Watkins	K. Crane R. Engler, P.Geol.
Manalta Coal Ltd. (Manalta) A. L. McLarty	R. Shaneman W. H. Tidswell
Petro-Canada Exploration Inc. (Petro-Canada) D. Kinton K. Winterbottom	
St. Regis (Alberta) Ltd. (St. Regis) J. Wright	J. Wright
Alberta Environment staff S. L. Dobko, P.Eng. C. S. Liu, P.Eng.	
Energy Resources Conservation Board staff M. J. Bruni, Board Solicitor J. D. Dilay, P.Eng. N. J. Duncan, P.Eng. B. C. Hubbard A. Cassley, P.Eng.	

because they processed gas with a lower acid gas content than the Robb-Hanlan area gas. Gulf stated that it did not appear economically attractive to process the Robb-Hanlan area gas in either existing plant and, environmentally, there would be a balance between a new plant and a long-distance sour gas pipeline. Gulf expressed a view that with the high potential for further gas discoveries in the immediate area, a new plant in the area would offer greater flexibility to accommodate the future potential than would use of existing plants.

The Board agrees that it would be necessary to process the gas for acid gas, water, and hydrocarbon liquid removal to meet pipeline specifications. With respect to a two-plant concept, it agrees that gathering system costs and associated environmental disturbance would be less, while plant capital and operating costs and environmental disturbance would be more, than for the proposed scheme. The Board has not made a detailed comparison of the economics and environmental impact of one plant versus two plants, but believes that the proposed scheme involving a large centrally-located plant would be more in the public interest than would a number of smaller plants.

With respect to processing the Robb-Hanlan gas in the existing Edson or Rimbey plants, the Board notes that these plants are some 17 and 90 kilometres from the proposed site, respectively. The Board agrees that generally it is preferable to limit the length of high-pressure sour gas pipelines by processing the gas at a plant in the area of the wells and then transporting the sweet sales gas. In this instance the Board is satisfied, having regard for economic, environmental, and safety considerations, that a new plant is more desirable than use of an existing plant.

Having regard to the above, and particularly in light of the less favourable alternatives available, the Board believes that there is a need to process the gas at a plant in the Robb-Hanlan area.

3 TECHNICAL AND CONSERVATION ASPECTS OF THE PROPOSED PLANT

Gulf stated that a maximum of 8.452×10^6 m^3 per day of raw gas would be processed for the recovery of 6.721×10^6 m^3 per day of sales gas. Liquid hydrocarbons would be recovered at inlet separators and at the hydrocarbon dewpoint control facilities (propane chiller). Gas off the chiller would be delivered to sales or used as fuel. Gas from the liquid hydrocarbon stabilizing system would be combined with low pressure flashed vapours from the amine regeneration system and used in the sulphur plant incinerator as fuel. Overall sulphur recovery efficiency would be at least 98.5 per cent using a modified-Claus process and tail-gas clean-up unit. The majority of the steam required for process heat would be produced in the sulphur plant with supplemental steam generated in power boilers. The power boilers and the sulphur plant incinerator would be the major direct consumers of fuel gas in the plant. Total plant fuel requirements would be some 0.25 x 10^6 m^3 per day. Provision would be made in plant design and layout for possible future expansion of the proposed facilities and/or possible future additions such as a carbon dioxide recovery unit.

The Board believes that the applicant's plans for hydrocarbon and sulphur recovery are appropriate in a resource conservation sense. Comments respecting the environmental aspects of the proposed sulphur recovery level are included in section 4 of this report. The Board is also satisfied respecting the technical details of the proposed plant.

4 ENVIRONMENTAL IMPACT OF THE PROPOSED PLANT

4.1 Air

Gulf stated that 98.5 per cent of the sulphur in the inlet sour gas would be recovered using a two-stage modified-Claus process and a tail-gas clean-up unit. Emissions would be no greater than 34.8 tonnes per day of sulphur dioxide at maximum throughput. Sulphur dioxide would be emitted from a 61-metre high incinerator stack to ensure adequate dispersion in the atmosphere. The calculated maximum ambient ground level concentration of sulphur dioxide would be within provincial air quality standards. Other combustion products such as nitrogen oxides would also be within provincial standards. The flare stack used to depressurize the plant during emergencies and plant shut downs would be 61 metres high. Gulf maintained that occasions for flaring would be infrequent and the duration would be restricted to maintain provincial standards. Maximum annual sulphur deposition was calculated to be half the natural background rate.

Sulphur recovered in the process would be stored in block form or would be formed into prills for shipment by rail. Gulf expected this method would generate less dust than other methods of handling and transportation. No long range sulphur dust effects are expected. Gulf said that odours and noise would not be noticeable except in the near vicinity of the plant.

On this basis, Gulf expected no serious adverse effect of emissions to the atmosphere on soil and vegetation. It was confident that air quality in Robb will not be affected.

Gulf said it intends to acquire air quality and meteorological information both before and after plant start-up. Soil pH would also be monitored.

On the basis of the operation of similar plants somewhat larger than that proposed by Gulf, the Board considers Gulf's evaluation of the impact of emissions to the atmosphere to be acceptable. The Board believes that the operation of the proposed plant would have no serious adverse impact insofar as air quality is concerned. The Board notes that the sulphur recovery level proposed by Gulf exceeds the guidelines set out in Informational Letter IL 80-24[1].

4.2 Water

Gulf stated that aquifers would supply the plant's water needs. Process waste water and produced water would be disposed of by deep well injection. Surface runoff from both the plant site and sulphur block area would be retained for treatment. Release to the environment would be infrequent. Two separate sewage systems would be used for sewage disposal from the construction camp and the plant. The landfill and sulphur storage sites would be chosen and worked to avoid ground-water contamination.

Although not part of the specific plant application before it, the Board has had general regard for the impact which the associated pipeline system might have on surface or ground water. In total, 27 stream crossings would be made for pipelines and roads. Gulf recognized the attendent problems of sediment addition, erosion of banks, stream substrate disturbance, and the resulting adverse effect on water quality. However, Gulf stated that these can be minimized by careful construction procedures and route selection.

The Board believes that the applicant's plans are reasonable with respect to control of potential impact on surface or ground water.

4.3 Land Disturbance

Gulf expects 700 hectares of land would be affected initially by the construction of the gas plant and associated pipelines, roads, and well sites. The land would be immediately revegetated with grass-forage mixture to prevent soil erosion and provide for natural reversion to forest. Some wildlife displacement would be expected. Merchantable timber would be salvaged and made available to the forest industry. Soil and vegetation monitoring would be carried out by Gulf.

The Board believes that Gulf's evaluation of unavoidable impacts on land is reasonable and that the proposed protective measures are appropriate.

4.4 Summary

Gulf stated that unavoidable environmental impacts of the proposed project would include a slight change in air and stream water quality, modest disturbances to surface and vegetation, and some displacement of wildlife. It said, however, that the gas plant site was chosen and the project was designed to minimize these adverse impacts. Final alignment of pipelines, railroad, and roads would take into account sensitive landscapes, wildlife areas, stream habitats, present land use, and other concerns. During the construction phase Gulf intends to have an on-site environmental inspector ensure that environmental protection measures are implemented.

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[1] Sulphur Recovery Guidelines - Gas Processing Operations. Informational Letter IL 80-24.

No interveners appeared at the hearing to present environmental concerns although two written briefs referred to possible health and community effects associated with increased activity in the area.

In consideration of the possible environmental impacts and the protective measures, the Board is of the view that the applicant has submitted a responsible proposal to ensure adequate protection of the environment.

5 SOCIAL AND ECONOMIC IMPACT OF THE PROPOSED PLANT ON THE AREA AND THE PROVINCE

Gulf stated that most of the construction workforce would be from outside the region and would be largely accommodated in camps equipped with dining and recreation facilities. Hence the construction phase was not anticipated to cause any appreciable change in the permanent regional population. Most construction material and equipment would come from Edmonton and other shipping points by truck transport although early completion of the railroad spur to the plant might facilitate rail usage. Peak traffic volumes could increase by as much as 80 vehicles per day on Highway 47 and by as much as 100 vehicles per day in the plant and field construction area, not including weekend commuter traffic. Gulf stated that these traffic volumes would cause considerable wear and tear to Highway 47 which is already considered by Alberta Transportation staff to present a difficult maintenance problem. Gulf stated that the construction phase would not alter demand for many aspects of regional and community infrastructure and services. There would likely be a slight increase in need for police and social services, and a moderate increase in demand for entertainment. Impacts on transportation would be greater.

Gulf submitted that the operations phase would create some changes in levels of demand for certain community services and infrastructure, primarily because of the projected population increment of some 300 persons to the Town of Edson. None of these changes could be considered serious impacts in the sense that they would significantly change the quality of life in Edson.

With respect to economic impact, Gulf estimated that the construction phase would generate a total of 16 to 18 million dollars in direct wages and benefits, but given the anticipated low levels of local participation in the project workforce, most of the wage bill would leave the region. Gulf estimated that local spending by construction camp residents could total some 80 000 to 120 000 dollars, of which a large portion would be in Robb. Local purchases in Robb and Edson by contractors were estimated at 350 000 to 400 000 dollars.

The Board believes that Gulf's proposed project would have a modest social impact on the area, although it would be transitory over the construction phase. The Board notes that other major resource extraction projects in the area are in various stages of development and will need to be provided for in terms of infrastructure, and services. Special efforts may be required by the province and industry with respect to Highway 47. With respect to economic impact, the Board believes that the project would have a net positive but modest impact on the area and the province.

6 FEASIBILITY OF TYING PRESENT AND FUTURE WELLS TO THE PROPOSED PLANT

Gulf indicated conceptual pipeline alignments generally following the shortest routes which would satisfy certain limiting factors known at the time of the application. These factors included general topography, critical wildlife areas, and proximity to communities, public facilities, and certain industrial operations. The indicated routes were chosen mainly using topographical maps. Route surveying was said to be underway and the alignments are subject to change.

With respect to the coal leases in the project area, Gulf stated that only those for which formal applications for mine development have been made were considered when the gathering system was designed. Infill and step-out drilling will be necessary for full exploitation of the gas fields.

The interventions of the coal companies were mainly concerned with the potential interference of the gathering system and field facilities in the safe and orderly development of the coal deposits.

Luscar questioned the shortest route philosophy and Gulf's apparent lack of knowledge of coal geology in the area. It stated a preference for routes in non-coal areas. Denison had similar concerns and questioned the extent of future developments. It suggested that the staging of wells and the relocation of pipelines to accommodate coal development be made a condition of approval of the gas plant, and requested three months notice of applications for the gathering system. Manalta was particularly concerned with the Robb Field (see Figure 1) and questioned the impact of delaying the exploitation of this field. It pointed out that one section of the gathering system bisects the designated townsite of Mercoal. St. Regis expressed concern with the impact of the pipeline on timber operations and pointed out that 100-tonne logging trucks would cross the pipeline.

The Board has only a gas plant application before it, however, it believes it must be satisfied that there is a reasonable route by which wells could be connected to the proposed plant before it can rule on the plant application.

Notwithstanding the concerns expressed by other resource owners in the area, the Board believes that an efficient and safe pipeline gathering system can be designed through co-operative efforts between the applicant and other owners, and is confident that the necessary applications for pipeline permits will reflect these efforts. The Board expects that these efforts will require a modification of the shortest route policy even though such a policy minimizes pipeline costs in most cases. The Board notes that where there is unavoidable negative interaction with other resources, which may involve future relocation of pipelines, the short-term economies may be outweighed by long-term considerations.

The Board intends that the coal and forestry industry will have sufficient notice of Gulf's intentions with respect to the gathering system but is not prepared to condition any approval issued to require the three-month notice period requested by Denison. The Board believes that its normal notice procedures would allow sufficient time for affected parties to register their concerns. In this respect, the Board notes that Gulf indicated an intent to contact potentially affected parties during its planning work.

The matters raised by other resource owners in the area are discussed further in the following two sections of this report.

7 IMPACT ON COAL RESOURCE OWNERS

Although most of the other resource owners' concerns related to the potential pipelines, and notwithstanding that the Board has indicated in the previous section that it is satisfied that acceptable pipeline routes can be found, in this and the next section the Board is dealing in greater detail with the concerns of the other resource owners. It is doing so to highlight those concerns in an effort to encourage negotiation and co-operation among resource owners in the planning of future facilities and operations in the area.

Gulf stated that the preferred location for the processing plant is partly on land as yet unleased to any coal operator and partly on coal leases of BP (Canada) Inc. The gas wells and gathering system would be located for the most part on coal leases of which only 6 per cent have been approved for mining. The major impact on coal developers would be through existing and future wells and the pipeline gathering system. Gulf said that the lack of precise data on the coal trends prevented a more detailed approach to pipeline routing.

Gulf indicated that negotiations had taken place with two coal mining companies during the preparation of the submission respecting the potential gathering system. These discussions were with Luscar, whose subsidiary Luscar Sterco (1977) Ltd. operates the Coal Valley thermal coal mine and processing plant, and with Manalta, which had submitted preliminary disclosures to government, for its Mercoal East and McLeod River properties. In Luscar's case, the permitted mine site area had been avoided in planning the pipeline network.

Gulf said that it had not negotiated with Denison, Petro-Canada, or other coal leaseholders in the area since it knew of no specific plans on their part and thus considered negotiation to be unnecessary. The applicant did state, however, that now it knew of the concerns, discussions would take place and hopefully agreements would be reached with affected coal leaseholders prior to any applications for pipelines or additional wells.

None of the coal resource owners opposed the proposed plant, although Denison indicated its preference for alternative Site No. 6 (see Figure 1). At the same time, all of the coal owners expressed concern about the safety aspects of carrying out mining operations in the vicinity of sour gas wells, their associated facilities, and the pipelines of the proposed gathering system. Figure 2 outlines the location referred to in the following discussion of the specific concerns of the coal resource owners.

Luscar was particularly concerned about the five wells and gathering system on its Yellowhead property, where some 26.5 million tonnes of coal, dipping at 45 to 70 degrees had been proven. Luscar stated that there are three wells on its Yellowhead Tower property, which had not been as extensively explored for coal as Yellowhead, but contained a probable 6.5 million tonnes of recoverable coal. Luscar noted that, although the applicant was made aware of coal trends in Luscar's leases in September 1979, the suggested gathering system surprisingly showed pipelines running longitudinally down the middle of both trends. A lone gas well, and its proposed pipeline, would effect Luscar's Oppelt property where some 9.9 million tonnes of recoverable coal had been proved.

According to Luscar, the proposed pipeline alignments would prevent normal mining operations and effectively eliminate development of most of these trends. The impact of wells would be the sterilization of approximately three million tonnes of coal, assuming the 400-metre set-back required by Section 76 of the Coal Conservation Regulations. Luscar proposed that wells located within the coal trends be limited by the Board to access only by pipelines intersecting the coal trends at 90 degrees, and that the main pipeline system be located off identifiable coal trends.

Manalta was concerned that the discovery well in the Robb Field, located on the edge of its McLeod River South property, and the proposed gas gathering system, could be damaged by blasting. This concern was made more serious by the high hydrogen sulphide content of the natural gas of over 30 per cent. As with Luscar, Manalta proposed that the gathering lines should be at 90 degrees to the coal trends and that studies should be made of the effect of open-pit rock blasting on wells and pipelines. Manalta also expressed concern about a significant step-out exploration well currently being drilled by Getty Oil (Canada) Ltd. This well lies between the adjacent coal trends in the leases owned by Manalta and Petro-Canada, and Manalta anticipated the possible sterilization of over five million tonnes of coal because of the well. Manalta stated that no notice had been given to it prior to commencement of drilling. The company did acknowledge, however, that the proposed gathering line from the Mountain Park gas field had been amended to avoid the Mercoal East property.

Manalta considered that Informational Letter IL 80-14[2] should be revised. It considered that the Board policy it contained was rather arbitrary in its nature, and more suitable to the Plains Area. It stated that the letter should be reissued in the form of guidelines which would be flexible to meet situations such as the Gulf application. In particular, Manalta felt that IL 80-14 may not have had regard for sour gas wells and pipelines, or blasting in the hard rock often found as overburden in the Foothills and Mountain areas.

Denison had similar concerns about wells being drilled through coal seams with no notice to the coal leaseholder. Denison was particularly concerned about the potential sterilization of some three million tonnes (using the 400-metre set back) in its Robb Block where the proposed gathering pipeline would cut the property in two. Denison estimated this block to have approximately 60 million tonnes of product thermal coal which could be yielded by open-pit mining methods to a depth of approximately 150 metres. In its Hinton Block, the gathering system is proposed to parallel the coal trend in collecting sour gas from four wells adjacent to the potential mining area. The reserves in the Hinton and Mercoal blocks are in the order of 250 million tonnes.

Denison stated that, apart from receiving the environmental impact assessment prepared for Gulf's application, there had been no communication from the applicant to Denison on the proposed gas gathering and processing schemes. It was particularly concerned that the application did not disclose particulars of future development plans, reservoir pressures, gas contracts, or future potential well sites.

The interveners were all generally concerned about the lack of information on infill drilling and abandonment procedures for wells. All intervening coal companies declared the coal in the area to be high quality thermal coal for which markets are being developed. All were greatly optimistic that, over the next five years, rapid development of the coal resource would become necessary.

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[2] Coal Mining and Well Drilling on the Same Land - New Policy. Informational Letter IL 80-4.

The Board recognizes that the gathering system proposed by Gulf is conceptual only, mainly conceived on a shortest distance concept combined with general topography and limited information on areas of special concern. With the exception of rerouting of one pipeline to avoid Manalta's Mercoal East property, the Board notes that generally no consideration had been given to the coal trends in the area. Because of this, and in response to Manalta's concern respecting IL 80-14, the Board intends to review its procedures for handling applications for well licences and pipelines in coal areas in the coming months. In the meantime, the Board will not approve any future well licence, pipeline, or coal extraction applications in the area of the subject application without notice of it to other resource owners that could be affected, unless the applicant has demonstrated that prior agreement has been reached. The area referred to includes the Medicine Lodge, Robb, Shaw, Mountain Park, Coalspur, Lovett River, and Hanlan gas fields as described in Gulf's application, plus the intervening areas contiguous to the proposed gas gathering system. In addition, the Board intends to give notice to the owners of Crown forestry leases unless evidence is presented respecting discussions prior to the application.

It would not be appropriate for the Board to give specific direction on a gas gathering system prior to the consideration of pipeline applications. However, where the terrain is suitable and economics permit, it does consider that a gathering system should generally be situated in areas barren of coal and, to the extent practical, with laterals to each well at right-angles to the coal trends. The Board is not aware of any published literature which would assist the designers of coal mines or gas gathering systems to determine the possible effect of coal overburden blasting on pipelines or wells but is concerned with the possible effects. The Board proposes that the applicant and interveners co-operate in on-site tests to determine the effect of blasting, or the effect on rock fragmentation of blasting patterns redesigned to mitigate against effects on pipelines or wells.

The Board considers it important that discussion between gas and coal producers include the timing and sequencing of the operations whereby one resource could be depleted prior to access to the other resource, or pipelines could be laid in backfilled and settled mining areas. The Board is of the view that where technology and economics allow, directional drilling of infill wells might be considered to avoid conflict in multiple resource development areas.

8 IMPACT ON TIMBER RESOURCE OWNERS

Gulf stated that, since the inception of the proposal, it had negotiated with the two holders of timber development rights in the area, St. Regis and Erith Tie Ltd. It noted that Erith Tie Ltd. had no plan for immediate development in the project area and that St. Regis' activities were currently in the Embarras and McLeod working circles (see Figure 3).

The proposed plant site would be located in an area which had been clear cut within the last five years and the applicant indicated its intention to drill wells wherever possible in recently clear cut areas. Salvable timber along rights of way, road allowances, and other working areas will be made available to St. Regis.

The applicant was confident that potential conflicts could be successfully resolved and noted that the work done on the environmental impact assessment will enhance the opportunity for scientific research in the project area.

St. Regis indicated that it was not opposed to the gas plant application but was concerned that forest growth in the area would be interrupted for periods ranging from 30 to 80 years and that losses would be most serious in regenerated stands. It pointed out that logging trucks carried 100-tonne loads and that these loads required unusually high clearance under overhead obstructions. St. Regis recommended that the roads, gathering pipelines, and electrical power lines be developed in common corridors to prevent unnecessary isolation of patches of timbered lands.

The Board notes that St. Regis did not oppose the plant application and was confident that ongoing co-operation between Gulf and timber resource owners would minimize the negative impact on the forestry resource. The Board expects that the design of forestry road pipeline crossings and the electricity lines will reflect the special needs of logging truck operations.

9 SUMMARY VIEWS RESPECTING THE PROPOSED PLANT LOCATION

Gulf considered the alternatives of delivering the gas in the area to two other existing plants in other areas. It contended that, while both existing plants have some spare processing capacity, neither could accommodate the proposed project's total volume. In addition, major additions or modifications to both plants would be required. Gulf stated that it did not appear economically attractive to process the Robb-Hanlan area gas in either existing plant, and environmentally, there would be a balance between a new plant and a long-distance sour gas pipeline. Gulf said a new plant in the area would offer greater flexibility to accommodate the high potential for further gas discoveries in the immediate area than would use of existing plants.

Gulf evaluated three alternatives for a new processing scheme in the area:

- a single plant near the geographic centre of the producing areas,
- a single plant near the "reserves centre" of the areas, and
- a two-plant concept with one plant serving the western areas and another plant serving the eastern areas.

Gulf indicated that it considered a two-plant concept to be less desirable than one centrally-located plant because, although the gas gathering system would be substantially reduced with accompanying reductions in pipeline cost and environmental disturbance, plant capital and operating costs would increase and plant-related environmental disturbance would essentially double.

Gulf selected two possibly suitable locations for each of the above alternatives (see attached Figure 1). The six sites were initially screened to ensure that, based on available information, there were no constraints that would preclude development. Each site was then subjected to four independent evaluations: engineering, biophysical, economic, and socioeconomic impacts. Gulf's analysis showed that the proposed site, some 11 kilometres east of Robb, was the most preferable overall. A potential seventh site some 4 kilometres north of Robb was also evaluated but, although less expensive than the proposed site, was found to be less desirable for biophysical and socioeconomic reasons. Gulf stated that alternative Site No. 6 east of Coalspur was considered much less suitable than other sites because of technical problems related to construction and access, resulting in higher costs, and potentially greater environmental disturbance.

Denison indicated its preference for alternative Site No. 6 on the basis that there is little if any potential for coal in the area, and additionally, the use of that site for the plant would involve a sweet sales gas pipeline rather than a sour gas gathering line passing through Denison's Robb leases.

In section 2, the Board concluded that there is a need for a plant in the Robb-Hanlan area because the alternatives of building a number of smaller plants in the area or processing the gas in existing plants in other areas were less favourable than a large, centrally-located plant in the area. The Board has also concluded that, with respect to the proposed site, the plant would be in the public interest in the matters of conservation, environment protection, and social and economic impact.

The Board believes that an efficient and safe pipeline gathering system can be designed and that impacts on the coal and timber owners can be minimized through co-operative efforts between the applicant and other resource owners in the area. Notwithstanding this, the Board intends to give notice of future well licence, pipeline, and coal extraction applications for the area to other resource owners that could be affected. With respect to the preference indicated by Denison for alternative Site No. 6, the Board does not believe that the difference in potential impact on Denison's Robb leases resulting from a sour or sweet pipeline passing through them is a strong enough reason in itself for the Board not to approve the proposed site. While the use of alternative Site No. 6 could lessen the potential impact on Denison, it could also impact severely on Gulf in terms of higher costs, and on the area in potentially greater environmental disturbance. The Board expects that Denison's concern will be a matter which Gulf will attempt to resolve through negotiation prior to its filing specific applications for pipeline permits.

Having regard for all of the above factors, the Board agrees that the proposed location is suitable.

10 DECISION

Having considered all of the evidence, the Board finds that the proposed plant is in the public interest and is prepared to approve Gulf's application. The Board will issue the required approval on receipt of the necessary approval from the Minister of the Environment.

ISSUED at Calgary, Alberta this 22nd day of January 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy, P.Eng.
Vice Chairman

C. J. Goodman

C. J. Goodman, P.Eng.
Board Member

E. Kupchanko

E. E. Kupchanko, P.Eng.
Acting Board Member

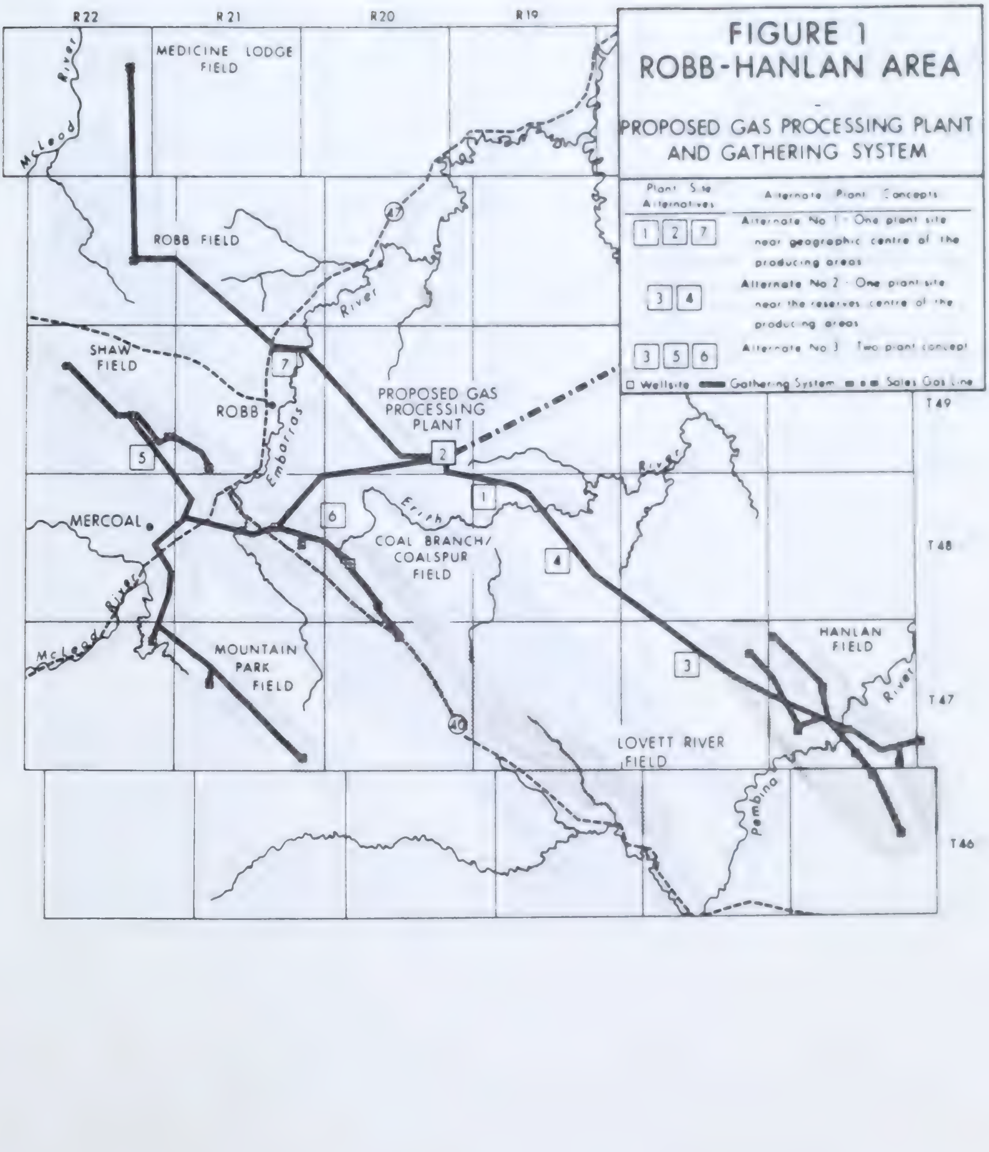

FIGURE 1
ROBB-HANLAN AREA
-
PROPOSED GAS PROCESSING PLANT AND GATHERING SYSTEM

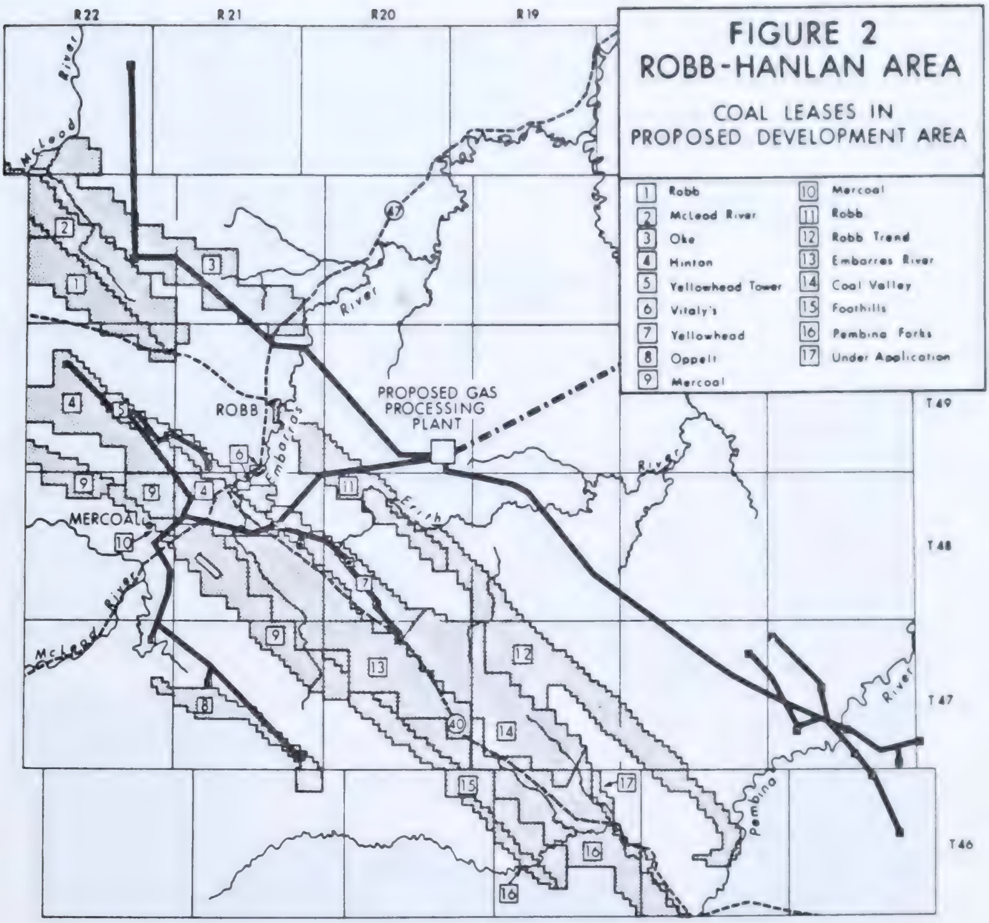

FIGURE 2
ROBB-HANLAN AREA

COAL LEASES IN
PROPOSED DEVELOPMENT AREA

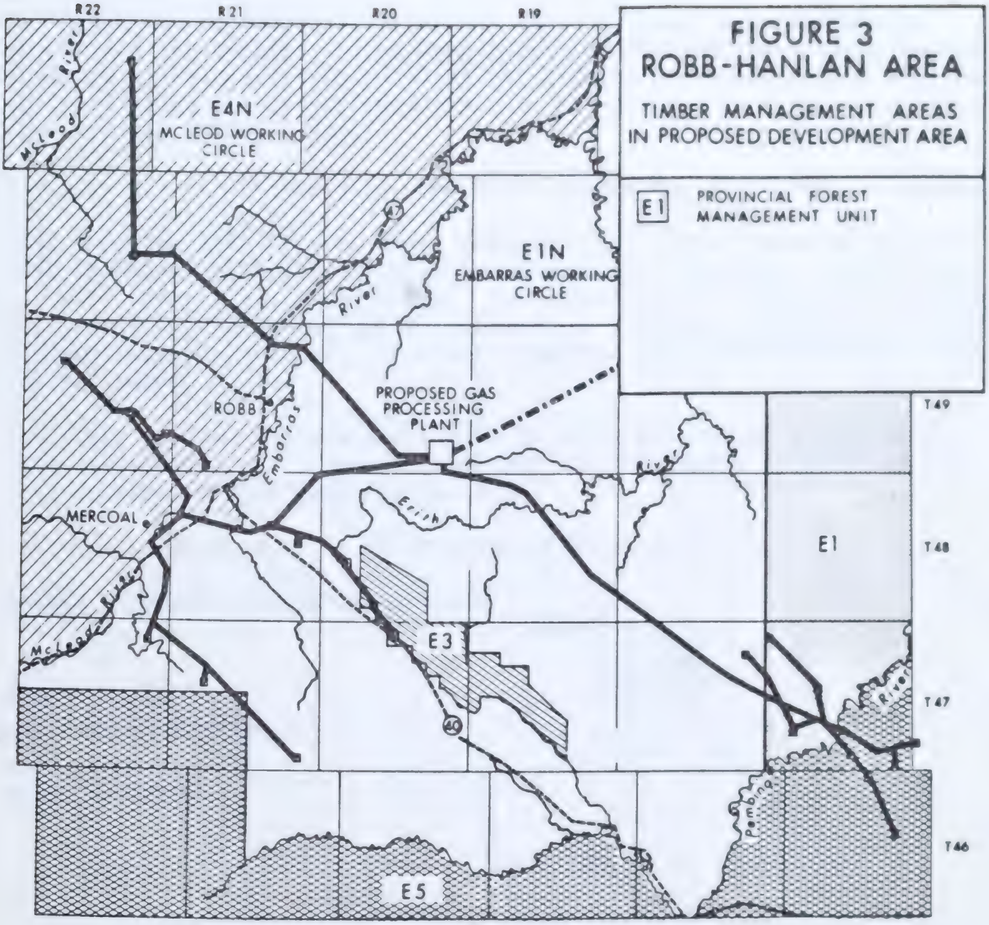

FIGURE 3
ROBB-HANLAN AREA

TIMBER MANAGEMENT AREAS IN PROPOSED DEVELOPMENT AREA

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ENERGY RESOURCES CONSERVATION BOARD

Calgary, Alberta

Enhanced Recovery by Ethane Enriched Miscible Flood
Caroline Viking A Pool

Decision 81-2
Application 790732

The Board has reviewed the report of its examiners, attached hereto, respecting the application by Dome Petroleum Limited, as a major working interest owner under Section 38 of the Oil and Gas Conservation Act, for approval of an ethane enriched miscible gas flood scheme in a portion of the Caroline Viking A Pool.

For purposes of its decision, the Board adopts the examiners recommendations.

Following the hearing, the Board received your letter dated 19 December 1980 amending the application by increasing the bank size to 25 per cent of swept hydrocarbon pore volume. The solvent bank volume was increased to 1,000,000 m^3 from 650,000 m^3 measured at reservoir conditions, and the minimum water-solvent and water-gas injection ratio was amended to 0.25 volume/volume.

The Board accepts the amended values as being consistent in direction with its examiners' recommendations and the amendments as proposed have been incorporated in Approval No. 3252.

DATED at Calgary, Alberta on this 2 day of March 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy
Vice Chairman

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

ENHANCED RECOVERY BY ETHANE ENRICHED MISCIBLE FLOOD
CAROLINE VIKING A POOL
DOME PETROLEUM LIMITED

Examiners' Report
Application No. 790732

1 INTRODUCTION

1.1 The Application

Dome Petroleum Limited, as a major working interest owner in the subject pool, made application under Section 38 of The Oil and Gas Conservation Act for approval of an ethane enriched miscible gas flood scheme in a portion of the Caroline Viking A Pool (the A Pool), Figure 1.

1.2 The Hearing

A public hearing to consider the application was held by examiners appointed by the Energy Resources Conservation Board on 29 September 1980 with J. A. Bray, P.Eng., H. Keushnig, P.Eng., and G. H. Stafford, P.Geol. sitting. Participants at the hearing are listed on Table 1.

Interventions were filed by Amoco Canada Petroleum Company Ltd. (Amoco), Hudson's Bay Oil and Gas Company Limited (Hudson's Bay), and Wintershall Oil of Canada Ltd. (Wintershall). Amoco stated that it endorsed the concept of miscible flooding in this portion of the A Pool but filed an intervention questioning the technical design of the proposed miscible flood. The Hudson's Bay intervention primarily addressed the 'west-east block' interaction, Figure 1, but also inquired into potential operational problems.

Wintershall limited its questions to matters pertaining to the stage of unit negotiations.

Table 1
THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in the Report)	Witness
Amoco Canada Petroleum Company Ltd. (Amoco)	
B. Howes, P.Eng.	B. Howes, P.Eng.
Dome Petroleum Limited (Dome)	
A. Balasch, P.Eng.	B. Alberts, P.Eng. R. C. Jaenen, P.Eng. P. Sigmund, P.Eng.
Hudson's Bay Oil and Gas Company Limited (Hudson's Bay)	
G. J. Besserer, P.Eng.	G. J. Besserer, P.Eng.
Wintershall Oil of Canada Ltd. (Wintershall)	
J. Murdock, P.Eng.	
Energy Resources Conservation Board Staff	
P. M. Stanton, P.Eng. R. J. Willard, P.Eng.	

1.3 Background

The Caroline Viking A Pool is an oil reservoir containing 9800 x 10^3 m^3 of oil-in-place. An extensive up-dip gas cap is also present. The A Pool may be divided into three adjacent segments in different stages of depletion and with different ownership and proposed recovery methods. An "eastern block", immediately adjacent to the gas cap and with Hudson's Bay and Altana Exploration Company as the principal interest owners, is in an advanced stage of primary depletion with increasing GORs and decreasing oil productivity. A "western block" with Dome and Amoco being the principal interest owners, is in a less mature stage of depletion, and has better well productivity, lower gas saturation and relatively high pressures when compared to the "eastern block". A pressure gradient exists from west to east. The third pool segment is a recent western extension to the A Pool wherein overall performance and ultimate potential is unknown due to limited development and production. In addition to the principal interest owners noted previously, a large number of small interest owners are also present.

The optimum depletion of the A Pool has been the subject of extended study in recent years following Board requests to all operators for submission of enhanced recovery feasibility reports. Dome's Application No. 790732 pertained to the "western block" of the A Pool. Dome reported that unit negotiations are underway and that it is confident that full participation will be achieved.

Hudson's Bay filed a separate submission regarding the "eastern block" of the oil pool recommending continuation of primary depletion. The proper depletion mode in this region will be the subject of separate Board review.

2 ISSUES

The examiners have identified the following major technical concerns:

(1) Solvent Bank Design including:

  1.1 Solvent Bank Volume Requirements
  1.2 Miscibility Conditions
  1.3 Bank Placement
  1.4 Water - Solvent Slug Design

(2) Ultimate Recovery

(3) Special Monitoring and Reporting Requirements

3 SOLVENT BANK REQUIREMENTS

Views of Dome

Dome proposed to inject a solvent bank volume of 598 160 m^3 measured at reservoir conditions, equivalent to 15 per cent of swept hydrocarbon pore volume (H.C.P.V.) of the project area. This volume may also be reported as 7.2 per cent of total project H.C.P.V. or 9.0 per cent of total pattern H.C.P.V. Dome proposed to follow the solvent bank with a solution gas buffer zone and use nitrogen as the drive or push gas. Dome commented that it did not conduct, or have access to, numerical simulation of either bank design or recovery sensitivity to different solvent bank sizes. It based its bank design on a qualitative assessment of published literature predictions and an appreciation of similar operating miscible flood schemes. Much of Dome's study used experience factors derived from its Willesden Green Cardium miscible flood operation which also incorporates a bank volume equal to 15 per cent swept project H.C.P.V. (7.2 per cent of total project H.C.P.V.). Dome stated that the Willesden Green scheme had values of mobility and permeability variation comparable to the A Pool.

Dome questioned the effectiveness of any additional increases in bank size based on injected volume distribution. It was Dome's position that a large percentage of any additional solvent bank increase would enter the more permeable zones where excess solvent gas was already available and that no appreciable improvement to oil recovery would be derived in the less permeable zones.

Views of the Intervenors

Amoco stated that the proposed solvent bank volume was not, in its opinion, adequate to sustain miscible sweep throughout the reservoir. Amoco had not conducted any separate modelling of bank requirements and its views were based on a general understanding of bank criteria and analysis of other miscible flood schemes. It reported bank sizes as typically ranging from 10 to 15 per cent H.C.P.V. but when questioned, could only address specifically its South Swan Hills miscible scheme. Amoco stated that its Swan Hills approval specified a minimum 10 per cent H.C.P.V. per pattern bank requirement; however, current economics had permitted expansion to a 15 per cent H.C.P.V. bank size.

In general terms, Amoco expressed a view that the more severe the stratification the larger the solvent bank necessary to sweep the less permeable zones, subject to economic constraints. Amoco also believed that larger banks would be required for pools with more adverse displaced-displacing fluid mobility. Amoco noted that its South Swan Hills scheme had a severe Lorenz Coefficient of permeability, 0.9, as compared to a Lorenz Coefficient for the subject scheme of 0.38. However, Amoco countered any arguments for a comparative reduction in bank sizes by submitting that the A Pool's water wet system should result in a larger degree of solvent entrapment by water injection and hence greater mixing effects and larger bank requirements than for the South Swan Hills scheme's oil wet system. Amoco, in response to questions, stated that its calculation of a 10 per cent bank size for the Swan Hills scheme had adopted a water wet system thereby incorporating the worst degree of mixing zone effects and increasing the solvent bank design's safety factor.

Amoco summarized its position by stating that it would like to see a small increase in bank volume and that, additional studies, by way of recovery versus bank sizes, would be necessary to satisfy its concerns. Amoco could not comment on whether it was in a position to conduct such sensitivity studies itself but implied that resolution of bank size requirements would play an important role in any satisfactory unit negotiations.

Views of the Examiners

The examiners have accepted the general premise that for an effective miscible displacement to be achieved, the solvent bank should be designed such that a miscible bank is maintained at all times between the displaced oil and the displacing gas. As the solvent bank is displaced through the reservoir, dilution of the bank occurs at both the leading and trailing edges as a result of molecular dispersion and diffusion. However, previous studies in other pools have indicated that for horizontal miscible floods, determination of bank sizes based on a calculation of mixing zone lengths only is inadequate and must be significantly adjusted for bank degradation due to the detrimental effects of reservoir heterogeneities, viscous fingering, gravity override and residually trapped solvent.

The examiners note that Dome and Amoco are cognizant of the influences of these factors in bank design and both incorporated reasonable allowances for these parameters in their slightly different estimates of solvent bank requirements. The examiners are of the opinion however, that it is not possible to quantitatively design a precise volume requirement.

In addition, the examiners are of the opinion that discussion and cross-examination at the hearing indicated a less than adequate level of participant involvement in the unit negotiations and design co-ordination phases of the scheme planning. The examiners suggest that further optimization study will be necessary as additional wellbore evidence and performance data becomes available and that both Dome and Amoco have valuable and varied experience backgrounds to contribute to final bank design.

In assessing the technical merits of Dome's proposed bank requirement, the examiners have reviewed existing Alberta field operations.

Two partly comparable and applicable operational projects are Dome's Willesden Green Cardium and Amoco's South Swan Hills BHL miscible flood schemes. Comparision of these schemes with the A Pool, noting mobility and reservoir stratification, do not, alone, support increases in bank volumes. However, having recognition of the possible influences of wettability differences and noting the presence of gas saturation which the examiners consider may adversely affect performance especially in the eastern half of the scheme, the examiners believe that a nominal increase in bank volume to 10 per cent of total H.C.P.V. is in order.

The examiners agree with Dome's argument that solvent bank volumes should accomodate volumetric sweep. This is especially true for the areal sweep component, the larger the areal sweep the larger the necessary bank. However, for the vertical sweep component, the examiners believe that Dome's presentation of injection volume distribution, from which it concludes that increases in injected volumes would result in only a marginal increase in contact reserves, is restricted in that it applies only if there is no crossflow between intervals of high and low permeability. Dome's model does not account for solvent-oil mixing and bank degradation attributed to crossflow of solvent and oil induced by vertical permeability "stratification" or heterogeneity. This effect may be relatively significant in the A Pool where few shale layers, capable of retarding crossflow, are evident betwen the more permeable and less permeable sections.

Therefore, the examiners, while generally concurring that increases in bank volumes will not result in proportional increases in miscibly contacted reserves, believe the recommended bank volume increases will be effective over a larger area than submitted by Dome.

While the examiners have adopted Dome's average permeability distribution as being reasonably representative of the available core data, the examiners note that a few wells have measured a more severe flow distribution in isolated, random locations. The possible presence of thin, 'thief' zones may disproportionately affect injection profiles such that insufficient solvent volumes remain to achieve desired recovery levels in specific patterns. The extent of any abnormal permeability distribution will be more evident following the infill drilling program proposed by Dome, Figure 2, and the examiners believe that an accurate design analysis per pattern would be appropriate at that time.

4 MISCIBILITY

Views of Dome

Dome proposed to operate the subject miscible flood at a pressure of 20 000 kPa with a corresponding solvent C_2+ composition of 51 per cent; equivalent to an enrichment ratio of about 1045 kg of ethane per 10^3 m^3 of lean gas. In its initial application, Dome submitted preliminary estimates of the required pressure versus solvent composition necessary to achieve miscible displacement as determined from Benham's correlation.[1]

This correlation indicated an operating pressure of 18 961 kPa would be required, consistent with the suggested enrichment level. Dome subsequently submitted the results of a series of laboratory slim tube tests conducted to confirm the pressure requirement. Interpolating these data, Dome defined a slightly higher miscibility pressure of 20 000 kPa for a solvent having a C_2+ composition of 51 per cent and amended its application accordingly.

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[1] Benham, A.L., Dowden, W.E., and Kunzman, W.J., Miscible Fluid Displacement - Prediction of Miscibility, Petroleum Transaction, AIME, vol. 219,1960.

Dome also submitted its estimate of the system's phase behaviour as given by a ternary diagram. Dome commented that it viewed the proposed pressure - solvent composition relationship as sufficient to achieve first-contact miscible displacement.

Dome, in reply to questions, stated that the proposed miscibility conditions did not contain any provision for a safety factor. Further, Dome cautioned that the scheme's overall economics were marginal and that excessive safety factors would subject the proposed scheme to a complete economic review.

Views of the Examiners

Benham's correlation predictions are considered useful for initial feasibility study and for extrapolation of limited slim tube tests. Ternary diagrams, are important in understanding the miscible displacement mechanisms and in assessing bank size and effects of gas saturations. However, in assessing the miscibility relationship of pressure versus solvent composition, the examiners believe that laboratory slim tube test results are most relevant.

The examiners agree with Dome that, under the conditions of the laboratory slim tube tests, miscibility with a solvent having a 51 mole per cent C_2 plus composition will require pressures not less than 20 000 kPa, in order to achieve miscibility. The examiners note that the laboratory tested miscibility function has a higher pressure- enrichment requirement than calculated by Benham.

The ternary diagrams indicate that all mixtures of solvent-push gas would be in the single phase region thereby ensuring gas-solvent, trailing-edge miscible displacement.

Subsequent to the hearing a review of the submitted ternary diagrams, calculated using the Soave-Redlich-Kwong equation of state, has lead the examiners to question their validity as they appear to be in direct conflict with the slim tube tests results. Tests conducted at 18 961 and 19 651 kPa did not achieve miscible displacement although the submitted ternary diagram would suggest these systems should be fully first contact miscible. The examiners conclude that first contact miscibility at the proposed operating conditions is therefore not confirmed by the data presented, and propose that Dome conduct and submit laboratory check points of the calculated phase envelope.

the oil and gas would be rolled ahead. Dome referenced slim tube tests, conducted in the presence of gas saturations, as evidence that no adverse performance would result and that repressuring of all areas, so as to permit gas to be reabsorbed back into solution, would not be a necessary operation.

Dome amended its application during the hearing to include a water fence along the eastern scheme boundary by water injection into the 8-15 and 8-22-35-6 wells.

Views of Examiners

The examiners have studied Dome's proposal to design the scheme to maintain miscibility at the flood front pressure level. It is noted that Dome's calculation is for the average pressure case and that the lower reservoir pressures along the eastern edge will place a heavier burden on gas injection to achieve and maintain a 20 000 kPa flood front pressure. Dome's calculations are considered restricted as it incorporates the exponential, infinite acting, integral solution in its pressure transient analysis, thereby largely reflecting the early time, wellbore region only. Other limitations include the input of assumed inter-well reservoir flow parameters and the absence of negative pressure gradients from producing wells when determining effective flood front pressure.

The examiners are reasonably convinced, nonetheless, that a high flood front pressure can be achieved and maintained by injected gas. However, it will be necessary to continuously monitor scheme performance and pressures and correspondingly adjust injection volumes. Within this layered reservoir, at various stages of depletion, the examiners expect scheme performance will require separate operation of individual patterns with measurably differing injection rates.

The examiners support Dome's proposed plan for overenrichment during the initial injection stages and accept its approximate estimate of composition requirements at lower pressures. The examiners fully concur with Dome's proposal to expand its slim tube testing in order to confirm enrichment requirements when actual operating conditions are determined.

The examiners are concerned that gas saturation in advance of the solvent bank might be detrimental to performance. The examiners believe that the removal of the light ends from the reservoir oil through pressure depletion could either hinder achievement of miscibility or result in very large mixing zone lengths. High gas saturation either from severe pressure decline or gas migration and accumulation in permeable layers could also be detrimental to displacement efficiencies.

Nonetheless, the examiners are of the opinion, that provided first contact miscibility is achieved, the effects will be minimized and only a small increase in bank size to balance the gas saturations effects would be necessary.

The examiners concur with Dome's proposal to inject a gas buffer zone subsequent to solvent bank placement and further support the proposed injection of nitrogen as the push gas. This will be the second such use of nitrogen in Alberta, following a similar proposal in the Willesden Green Cardium miscible scheme. At the reported cost savings, injection of nitrogen represents an important design change from previous schemes and should favourably affect the relative economics of horizontal miscible flooding.

The examiners recognize the need for the injection of a water fence along the eastern scheme boundary and favourably view this amendment to the initial application as a source of partial pressure maintenance in the most severely depleted area of the scheme. As such, the examiners encourage Dome to commence water injection as soon as possible.

6 WATER-SOLVENT SLUG DESIGN

Views of Dome

Dome proposed to inject alternative slugs of water and hydrocarbon in both the solvent bank and the gas buffer zone in order to reduce mobility ratios, maximize vertical sweep efficiencies and hence control the inherent instability of the horizontal miscible flood. Dome calculated a cumulative effective reduction in solvent-oil mobility from 33.8 to 10.5.

During its discussion of water volumes required, Dome cited several possible operational problems arising from water injection. In the thin, relatively tight A Pool, water slug injection may result in subsequent gas injectivity problems. In addition, mobile water at the producing wells would severly reduce relative permeabilities to oil and gas around the wellbore. Also, Dome was of the opinion that mobile water with its associated lifting problems should be avoided.

In view of the anticipated operational problems, Dome has requested that injection be completely flexible with no specified water alternating gas (WAG) ratio in the approval. This request was to facilitate ease of corrective field operation.

As an upper design limitation, Dome calculated a WAG ratio of 1.63 to reflect the maximum volume permitted such that water would smear out at the wellbore exactly at miscible bank breakthrough. Volumes in excess of this WAG ratio would result in water travelling faster than and, in advance of, the solvent bank.

Dome also presented evidence of the effective mobility ratio as a function of WAG, calculated from Blackwell[2]. The calculations indicated that maximum per cent reduction of mobility would occur with a WAG of about 0.25. Dome proposed that it would initially operate the scheme at or about this value.

Views of Interveners

Amoco intervened on the subject of the WAG ratio for purposes of obtaining clarification of the proposed operation. Amoco fully supported the advantages of equal fluid velocities and calculated a corresponding WAG ratio of 1 water to 3 solvent. It noted that this volume approached the economic optimums generated from Blackwell's relationship of WAG and mobility ratio. Amoco believed that a minimum WAG should be included in the approval.

Views of the Examiners

The examiners concur with both Dome and Amoco that a WAG ratio resulting in equal fluid velocities would ensure minimum production well problems and optimum displacement conditions. Further, having recognition of both potential injection limitations and the economic optimization generated by Blackwell's calculations, the examiners believe there is merit to further minimizing the WAG ratio.

However, the injection of water will serve a primary function of improving vertical sweep and control of viscous fingering through mobility control. Therefore, the effectiveness of water injection to improve the inherent instability of a horizontal miscible flood will decide the scheme's ultimate performance and final recovery.

For this reason, the examiners believe that a minimum WAG ratio equal to 0.3 should be set and that Dome be requested to closely monitor performance and test operational behavior at higher injection rates.

7 RECOVERY

Views of Dome

Dome reported a volumetric oil-in-place of 6 051 000 m^3 within the proposed scheme area. Dome estimated the recovery under primary depletion to be 10 per cent.

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[2] Blackwell, R. S., Terry W. M., Rayne J. R. and Lindley C.D., Recovery of Oil by Displacements with Water - Solvent Mixtures, Petroleum Transactions, AIME, volume 219, 1960.

Dome evaluated solvent flood recovery using a ten layer cross-sectional model that assumed miscible displacement. The injection of water for the purpose of mobility control was included, on a declining injectivity scale, in which the most permeable zone received three-fourths of the calculated optimum mobility reduction. The remaining layers received mobility control in proportion to injected water volumes based on kh values. The least permeable zone received virtually no benefit. The relative permeability data used in the model was adopted from the Willesden Green Cardium miscible flood scheme. Dome reported that its miscible flood model results indicated a pattern recovery under miscible flooding of 60 per cent. Project recovery was predicted to be 48 per cent after accounting for unswept edge losses. The sweep efficiency at solvent breakthrough was predicted to be 0.149.

Views of the Examiners

The examiners recommend adoption of an oil-in-place for the scheme of 6 500 000 m^3, based on a slightly different volumetric interpretation, when compared to that proposed by Dome.

The examiners believe primary recovery calculations should include not only depletion drive as proposed by Dome but also some recognition of a gas cap segregation drive. Available decline analysis for the older eastern region suggests recovery estimates in excess of predictions incorporating internal gas drive only. However, the examiners acknowledge that the benefits from gas cap expansion energy would decrease with distance from the gas-oil interface. As such, the examiners recommend a primary recovery factor of 12 per cent in partial recognition of a segregation drive.

The Board has conducted additional cross-sectional model studies of the proposed miscible flood scheme, testing relative fluid and rock permeability sensitivity. The examiners find that Dome's model predictions reasonably demonstrates the inherent instabilities of a horizontal miscible flood. However, the examiners hold a somewhat more pessimistic view of the effectiveness of mobility control in this layered reservoir and recommend a slightly lower recovery factor of 45 per cent. The resultant established reserves would be 2 925 000 m^3.

8 SPECIAL REPORTING REQUIREMENTS

Views of Dome

Dome did not submit detailed proposals for well testing or scheme monitoring but reported that a number of wells would be selected following commencement as observation points for frequent sampling, testing and close monitoring. Dome agreed to maintain surveillance and reporting on a pattern basis.

Views of Examiners

The examiners conclude that early, detailed scheme surveillance is crucial in determining the effectiveness of mobility control, flood front pressure behaviour and injection distribution. The examiners are satisfied that Dome recognizes the importance of adequate performance monitoring and accepts the need for a regular program of testing and project surveillance. The examiners suggest that in addition to the recommended reporting requirements set forth in the forthcoming approval that Dome investigate the potential of using radioactive isotopes in the injected solvent, gas and water as a means of monitoring the areal flow of injected fluids.

9 RECOMMENDATIONS:

The examiners recommend that:

(1) The Board approve the application as submitted with the following changes:

- (a) a minimum solvent bank volume requirement of 650 000 m^3 measured at reservoir conditions, and
- (b) a minimum WAG ratio of 0.3 be established.

(2) Dome be requested to submit, in addition to the normal reporting requirements, the information specified in the Approval.

(3) The Board approve established reserves under miscible flooding of 2 950 000 m^3.

(4) Dome be requested to conduct and submit, prior to solvent injection, the critical points and laboratory test data to complete and confirm the submitted ternary diagrams.

DATED at Calgary, Alberta on the 27th day of February, 1981.

J. A. Bray, P. Eng

H. Keushnig, P. Eng.

G. H. Stafford, P. Geol.

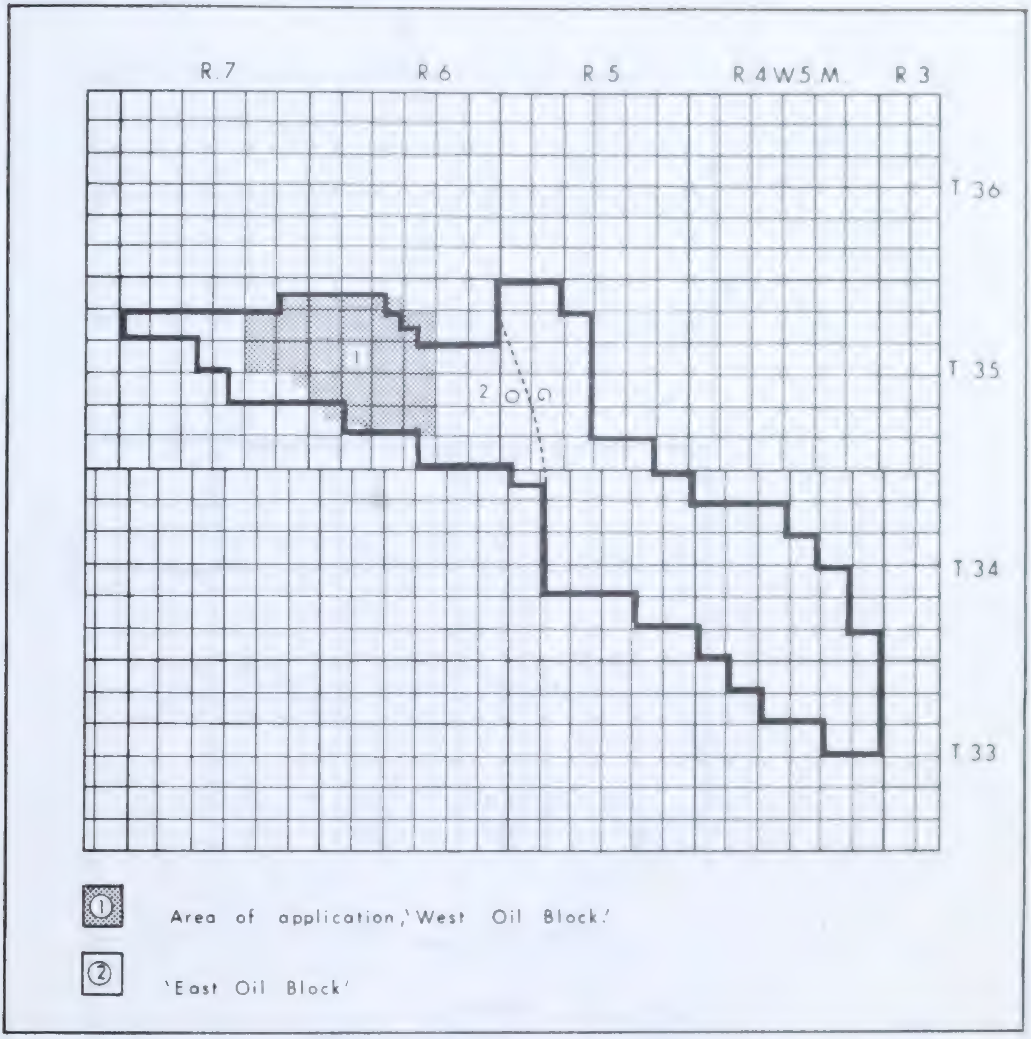

FIGURE 1 CAROLINE VIKING A POOL.

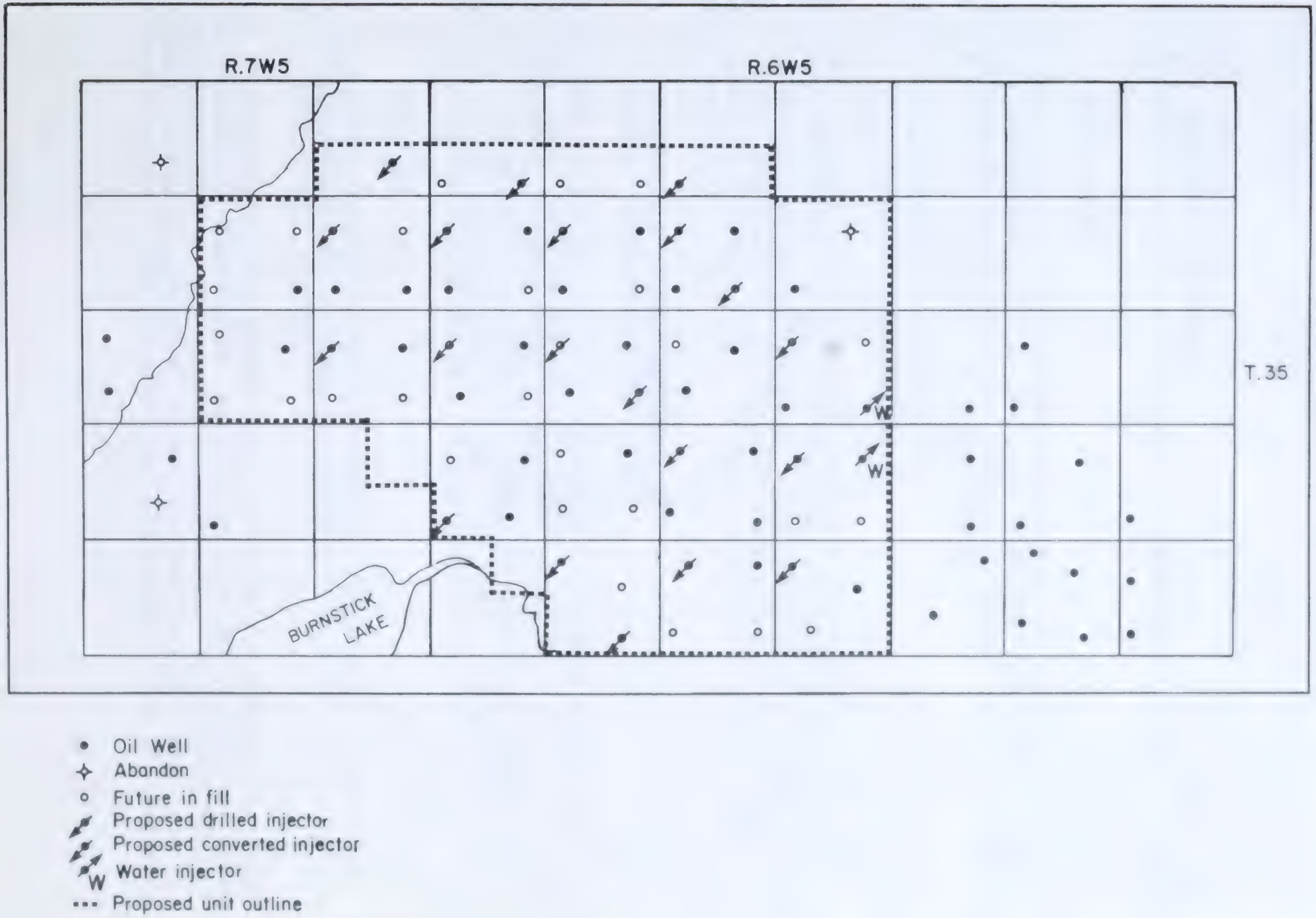

FIGURE 2 WELL LOCATION

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA CANADA

GOV'T DOC
APR 0 7 1981

56
Alta
36

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

STYRENE MONOMER PLANTS
ALBERTA ENERGY/ESSO CHEMICAL
SHELL/NOVA

Decision 81-3
Applications 800530 and 800733

1 APPLICATIONS

This report relates to two applications pursuant to section 42 of The Oil and Gas Conservation Act (the Act), for industrial development permits authorizing the use of ethylene, benzene, and natural gas as raw material and fuel for the production of styrene monomer.

1.1 Alberta Energy Company Ltd. and Esso Chemical Canada (AEC/Esso)

AEC/Esso requested a permit to authorize the maximum annual use of 131 million cubic metres of gas, 313 900 tonnes of benzene, and 113 900 tonnes of ethylene in the production of 400 000 tonnes of styrene monomer. The permit term requested was 20 years commencing with plant start-up projected for 1 January 1984. The plant would be constructed near Bruderheim.

1.2 Shell Canada Limited and NOVA, AN ALBERTA CORPORATION (Shell/NOVA)

Shell/NOVA requested a permit to authorize the maximum annual use of 146 million cubic metres of gas, 260 000 tonnes of benzene, and 98 000 tonnes of ethylene in the production of 345 000 tonnes of styrene monomer. The permit term requested was 20 years commencing with plant start-up projected for the fourth-quarter of 1984. The plant would be located adjacent to the Shell/Husky Strathcona refinery.

1.3 Hearings

Both applications were heard by the Board in Edmonton on 25 and 26 November 1980 with Dr. N. Berkowitz, P.Eng., V. E. Bohme, P.Eng., and F. J. Mink, P.Eng., sitting.

The Alberta Gas Ethylene Company Ltd., C-I-L Inc., and Shell/NOVA filed interventions in the AEC/Esso hearing. The Alberta Gas Ethylene Company Ltd., C-I-L Inc., and AEC/Esso filed interventions in the Shell/NOVA hearing. C-I-L Inc. presented evidence at both hearings, while the others appeared for the purposes of cross-examination and argument only.

Those who appeared at the hearing are listed below:

TABLE 1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Alberta Energy Company Ltd. and Esso Chemical Canada (AEC/Esso) D. G. Hart	W. R. K. Innis, P.Eng. F. Protto R. J. Swick, P.Eng. D. N. Gray, P.Eng. J. Craan, P.Eng. C. Newbury, P.Eng. R. J. Metzellaar J. Meheriuk, P.Eng. R. Towler, P.Eng.
Shell Canada Limited and NOVA, AN ALBERTA CORPORATION (Shell/NOVA) R. M. Curtis	Dr. J. Feick, P.Eng. L. F. Boldger H. Blair C. Sanders, P.Eng. D. Colley, P.Eng.
C-I-L Inc. (C-I-L) N. Putnam, Q.C.	Dr. H. C. Rowlinson
The Alberta Gas Ethylene Company Ltd. (AGEC) F. R. Foran	
Energy Resources Conservation Board staff K. Miller T. Walden P. Raina C. Burridge	

2 TECHNICAL ASPECTS

2.1 Proposed Process

The proposed plants of AEC/Esso and Shell/NOVA would be designed to produce 400 000 and 300 000 tonnes respectively of styrene monomer per year. However, Shell/NOVA believed that production at its plant could be increased to 345 000 tonnes and applied for quantities of feedstock and fuel based on this higher production rate.

Both applicants selected feedstock alkylation and ethylbenzene dehydrogenation processes licenced by Badger. The Mobil-Badger alkylation process utilizes a fixed-bed catalyst over which benzene is alkylated with ethylene at high temperature and moderate pressure. The Cosden-Badger process catalytically converts ethylbenzene to styrene monomer in the presence of superheated steam. By-product vent gas from both plants could be used as plant fuel or as a hydrogen source, depending on further economic evaluation. Heavy aromatic by-products would supplement natural gas which would be used at the proposed plants as fuel for process heating and steam generation. Both applicants believed that the use of residual aromatic by-products as feedstock for a catalytic cracker would be uneconomic. Toluene recovered from ethylbenzene production at the Shell/NOVA plant would be sent to the adjacent Shell/Husky refinery, presently under construction, for conversion to benzene. Toluene recovered at the AEC/Esso plant would be converted to benzene at the adjacent Petrochemicals Alberta Project (Petalta) benzene plant. As well, small reductions in overall energy usage could result from integrating certain of the proposed facilities with these adjacent plants.

The overall energy efficiency for each plant was estimated at about 68 per cent.

2.2 Environmental Impact

The applicants noted that the facilities would be designed, constructed and operated in full compliance with all relevant provincial environmental regulations and that gaseous and liquid emissions would be held to a minimum.

2.3 Social Impact

2.3.1 AEC/Esso

The applicant expected that most construction labour would be drawn from within Alberta. The construction phase would be short term, ending in late 1983. Because of the short duration of the construction period, bus transport of the work force from the Edmonton region was seen as a more viable arrangement than a construction camp. At its peak, construction would require up to 900 workers and would not be expected to impact significantly on the region.

The operating phase was estimated to require 116 permanent employees who, with their dependants, would form a population addition of 500 to 800 people in the area. Approximately 40 per cent of this total was expected to reside in Lamont and Bruderheim, 35 per cent in communities within 25 kilometres of the proposed plant, and 25 per cent in Edmonton and its suburbs. The only significant impact would be on the towns of Bruderheim and Lamont which would require some expansion of municipal and school services. The applicant did not estimate the effect of the induced employment that would be generated by the plant.

2.3.2 Shell/NOVA

The applicant's study of the economic, social, and community impacts of the proposed plant indicated that the construction work force would peak in 1983 at 430, and no problems were anticipated in obtaining this manpower since peak construction would follow that of the Shell/Husky Strathcona refinery.

The operation of the plant would require a labour force of about 120 persons and using an employment multiplier of 3.27, total indirect and induced employment resulting from operation of the plant would therefore be some 400 jobs. A survey of employees presently working in the area indicated that most refinery personnel would live in the metropolitan Edmonton region, particularly in Fort Saskatchewan and Sherwood Park. The applicant contended that the project was not expected to place undue strain on the provision of goods and services. Population growth through natural increases and further migration was expected to be accommodated by new housing developments within the study area.

3 ECONOMIC ASPECTS

3.1 Marketing

3.1.1 Views of AEC/Esso

World demand for styrene was projected to grow at a rate that would support some twelve new world-scale styrene plants by 1990, of which seven could be supported by the natural market area for an Alberta facility (North America and the Pacific Rim). One plant was identified as being currently under construction and three other world-scale plants outside Alberta were considered candidates for completion in the mid 1980s. AEC/Esso expected most of the output of the proposed styrene plant to be marketed at arm's length, ie to parties who are not related to the applicant. AEC/Esso expects to obtain a favourable market position through early completion of its plant relative to others being planned.

3.1.2 Views of Shell/NOVA

Shell/NOVA generally agreed with the AEC/Esso styrene demand forecast and concurred that, from a marketing viewpoint, there was room for two styrene plants in Alberta in the 1980s. However, Shell/NOVA contended that AEC/Esso's evidence indicated a need for 5.5 rather than 7 new world-scale styrene plants in North America and the Pacific Rim and expressed some concern about the wisdom of bringing two Alberta styrene plants on stream concurrently.

3.2 Economic Impact on Alberta

3.2.1 AEC/Esso

Applicant's Views

AEC/Esso found that the fuel and feedstock advantages of an Alberta location outweigh relatively higher costs of construction and shipping faced by Alberta plants competing in world markets. It argued that styrene represents greater upgrading of ethylene than production of polyethylene and should therefore have priority if ethylene allocation became necessary in the province.

AEC/Esso's estimates of the overall economic impact of its proposed styrene plant are shown in the following table.

TABLE 2 ECONOMIC IMPACT ON ALBERTA OF AEC/ESSO STYRENE PLANT
millions of constant 1980 dollars

	Per Application	Per Revision Presented at the Hearing[a]
Direct		
Project Investment	210	146
Operating Expenses	730	705
Provincial Taxes	114	245
Federal Taxes Returned	155	334
Reinvestment of Net Income	460	963
Sub-Total	1 669	2 393
Indirect	1 669	2 393
Total Direct and Indirect	3 338	4 786

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[a] Original application amended as to ownership.

Intervener's Views

Shell/NOVA disputed several of the cost figures submitted by the applicant and, in particular, challenged the propriety of allocating reinvested earnings as a benefit to Alberta. It also questioned the accuracy of components of operating costs.

3.2.2 Shell/NOVA

Applicant's Views

Shell/NOVA supplied an analysis of "gross economic impact" of its project on the Alberta economy and stated this to be on the same basis as AEC/Esso's assessment. This analysis is summarized in the following table.

TABLE 3 ECONOMIC IMPACT ON ALBERTA OF SHELL/NOVA STYRENE PLANT
millions of constant 1980 dollars

Direct	
Project Investment	125
Operating Expenses	300
Provincial Taxes	145
Federal Taxes Returned	215
Reinvestment of Net Income	880
Sub-Total	1 665
Indirect	1 665
Total Direct and Indirect	3 330

Shell/NOVA also noted that if it used the same basis as the revised AEC/Esso calculation presented at the hearings, total direct and indirect impact of its project would amount to approximately $4 billion.

Intervener's Views

AEC/Esso questioned the style of the applicant's summary of economic impact on Alberta, but did not provide an alternative version of the dollar amounts included in the analysis.

4 AVAILABILITY OF FEEDSTOCK AND FUEL

Views of AEC/Esso

AEC/Esso stated that its benzene requirements would be supplied by the proposed adjacent Petalta benzene plant. The benzene would be delivered by pipeline to storage facilities at the styrene plant.

The applicant pointed out that it is currently negotiating a contract to obtain its ethylene requirements from the AGEC Joffre complex through an anticipated pipeline from ethylene storage near Fort Saskatchewan.

Natural gas is expected to be purchased from one of the suppliers in the area and Calgary Power Ltd. could supply the electrical power.

Views of Shell/NOVA

Shell/NOVA stated that it proposed to utilize the total benzene production from the Shell/Husky Strathcona refinery which is presently under construction. The applicant provided a letter from Shell indicating its intent to supply benzene for the proposed styrene plant. Ethylene would be delivered to the proposed plant through a new pipeline from the AGEC storage facilities near Fort Saskatchewan. The applicant provided a letter from AGEC indicating that it intended to supply the proposed styrene plant's ethylene requirements. Gas required for the plant would be purchased from Northwestern Utilities Limited and Calgary Power Ltd. would supply the electrical power.

Shell/NOVA did not oppose the AEC/Esso application, but thought the proposal was premature. It stated that since ethylene feedstock had not been secured, process design was not firm at the time of the hearing, and arrangements for the Petalta benzene plant were incomplete, the project presented insufficient information for granting the application.

Intervener's Views

Through cross-examination AGEC noted that all its ethylene from AGEC I and II had been committed and that AEC/Esso should not expect a supply from these facilities. The applicant contended that it expected to reach a commercial arrangement for ethylene if it were issued a permit.

C-I-L expressed concern at both hearings regarding the availability of ethylene from the AGEC plants for its own proposed polyethylene expansion facilities. It stated that an ethylene shortage may occur in Alberta if all projects presently planned or under review by the Board were approved.

C-I-L noted that although its present facilities are currently supplied through a Dow Chemical Company of Canada, Limited contract with AGEC, its draft ethylene purchase agreement with AGEC for additional volumes had been pre-empted by an unannounced project. C-I-L asked that the Board, in view of a potential shortage of ethylene, consider all pending applications before issuing permits for the applications. C-I-L claimed that each application should be assessed on its relative merits before all available ethylene is committed on a first-come-first-served basis.

5 VIEWS OF THE BOARD

5.1 Technical and Environmental Matters

At the time of the hearing AEC/Esso had not selected process technologies and had therefore only provided estimates of feedstock and fuel requirements and of plant efficiencies. These estimates departed substantially from corresponding data which Shell/NOVA had submitted on the basis of specific technologies.

Subsequent to the hearing, AEC/Esso advised the Board that it had entered into licencing arrangements with Badger and submitted refined feedstock and fuel requirements as well as a revised estimate of plant efficiency. On the basis of these revisions the Board finds that the two proposed plants would be very similar, and that both would use technology that reflects the best commercially proven "state of the art". The Board is also satisfied that both plants would be designed, constructed, and operated in compliance with all relevant statutory provisions respecting safety and protection of the environment.

Accordingly, the Board would be prepared to authorize, for both applicants, the annual use of ethylene, benzene, and natural gas in quantities that would allow efficient operation. The Board notes that this implies authorizing AEC/Esso using 170 million m^3 of natural gas per year rather than the 131 million m^3 originally applied for. The Board recognizes that the AEC/Esso project has some potential for off-site sale of hydrogen and ethane and that this may prompt the applicant to apply for a somewhat larger volume of natural gas than now contemplated. However, the Board does not see this as a significant factor affecting the disposition of the subject application.

5.2 Social Matters

The Board agrees with the applicants that the direct social impact of the two proposed projects on the Bruderheim-Lamont area would be relatively small. However, it believes that the cumulative effect of five recently proposed facilities in the region (see Table 4) warrants careful consideration by government agencies with responsibilities for infrastructure matters. The Board notes that the combined labour force for construction of four of the five projects would peak throughout

TABLE 4 SUMMARY OF RECENTLY PROPOSED PETROCHEMICAL PROJECTS IN VICINITY OF PROPOSED STYRENE PLANTS

	ESSO FERTILIZER EXPANSION	SHELL/HUSKY REFINERY	SHELL/NOVA STYRENE PLANT	AEC/ESSO STYRENE PLANT	AEC/ESSO BENZENE PLANT
LOCATION	Sec 17 & 18, Twp 56, Rge 21 W4M	Sec 30NE, 31NE, 31SE, 32SE, 32NE, 32NW, 32SW, Twp 55, Rge 21, W4M & Sec 6SE, 5SE, 5SW, Twp 56, Rge 21, W4M	Sec 30NE, 31NE, 31SE, 32SE, 32NE, 32NW, 32SW, Twp 55, Rge 21, W4M & Sec 6SE, 5SE, 5SW, Twp 56, Rge 21, W4M	Sec 35, Twp 55, Rge 20, W4M	Sec 35, Twp 55 Rge 20, W4M
STATUS	APPROVED	APPROVED	APPLIED FOR	APPLIED FOR	APPROVED
YEAR OF START-UP	1983	1984	1984	1984	1983
AREA POPULATIONS	REDWATER (POP. 1 967)[a]	FT. SASKATCHEWAN (POP. 10 773)[a]		BRUDERHEIM (POP. 1 100)[a] LAMONT (POP. 1 247)[a]	
PEAK CONSTRUCTION LABOUR FORCE	2ND QUARTER 1982 910	3RD QUARTER 1982 2 000	1983 430	4TH QUARTER 1982 900	1980 - 1982 935
OPERATING LABOUR FORCE	150	232	121	116	220
ASSOCIATED LOCAL POPULATION INCREASE	600	1 000	500	500 - 800	680

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a From Municipal District of Sturgeon No. 90 Publication, March 1980 Population Estimates as of 1979.

1982 and 1983. While the relatively short construction phase of the Petalta project, and co-ordination of labour requirements for the Shell/NOVA styrene plant and the Shell/Husky refinery, would mitigate any problems posed by a large construction labour force, there would be a substantial increase in traffic, and the existing network of roads may require considerable up-grading.

As well, the towns of Bruderheim and Lamont may experience some difficulties from the added population associated with the operation of the four plants. While Shell/NOVA considered that sufficient new housing is scheduled in the area, the Board sees a need for up-grading of municipal and school services. Although both AEC/Esso and Shell/NOVA considered that increased revenues to local administrations and the Government of Alberta would more than cover public expenditures on improved infrastructures, the Board is of the view that some front-end government funding may be required to ensure that adequate services are in place before the plants commence actual operation.

The Board notes, in this connection, that a 20-year permit for both applicants is appropriate for the proposed projects.

5.3 Availability of Feedstock and Fuel

The Board is satisfied that sufficient gas will be available in Alberta for the proposed uses over the permit terms requested. The Board accepts that the benzene supply would be obtained from the proposed Petalta benzene plant for AEC/Esso's project and from the Shell/Husky benzene plant for the Shell/NOVA project and that sufficient benzene would be available for both projects.

Having regard for already approved ethylene producing and consuming facilities, the Board is also satisfied that sufficient ethylene will be available to meet the requirements of the two proposed projects. It would, however, require that both applicants fully secure their respective supplies of ethylene, and satisfy the Board on this matter prior to plant start-up.

The Board does not believe that it would be proper to delay these or any other applications pending consideration of other potential ethylene derivative applications.

5.4 Marketing

Considering the availability of "swap-outs", in which styrene marketed by one producer will actually be shipped from a competing producer's plant in order to minimize transportation costs, the Board believes that styrene markets should be considered on a global basis. The applicants agreed that meeting the growth in world demand for styrene throughout the 1980s will require the construction of a number of styrene plants. Both applicants expect to sell primarily to "merchant" rather than "captive" customers[1], and the Board recognizes that a large part of the growth in styrene demand will occur in "captive" markets to which neither applicant has access. However, the Board believes that world-wide "merchant" demand for styrene will continue to grow sufficiently to ensure that any over-capacity associated with the commissioning of two styrene plants in 1984 would be short-lived.

Given the continuing supply and price advantages of Alberta petrochemical producers, the Board expects further petrochemical production in Alberta. The Board agrees with AEC/Esso that an important advantage to prospective Alberta producers is the ability to bring a facility on-stream at an early date.

5.5 Economic Impact

The Board cannot reconcile the differences in cost estimates presented by the two applicants, particularly those respecting taxes, construction costs, and operating costs. It conjectures, however, that differences in forecast prices of fuel, feedstock, and styrene output, and different assumptions respecting financing arrangements, could have led to different cost estimates.

The Board has attempted to adjust differences in the applicants' estimates of capital and operating costs of the two proposed styrene plants to reflect the fact that identical technology would be employed. During the construction period from 1981 to 1984 the AEC/Esso project would entail capital expenditures of $190 million[2] of which $140 million were estimated to be spent in Alberta. Using an income multiplier of 2.0, the total economic impact on Alberta arising from the construction phase would be some $280 million. These figures were arrived at by using the Shell/NOVA construction cost estimates for AEC/Esso and adjusting for scale. The Shell/NOVA project over the same period would entail expenditures of $160 million of which $120 million were estimated to be spent in Alberta, for a total Shell/NOVA construction-phase impact of $240 million within the province.

Neither applicant presented a detailed analysis of commercial viability although both applications contain many of the ingredients for such an analysis. To provide some measure of the relative economic impact of the two projects the Board prepared a comparison as shown in Table 5. The Board's economic analysis incorporates current U.S. prices for feedstock and styrene output together with the Board's projection of Alberta fuel prices. Excluded from the Alberta impact is reinvestment of earnings, since the Board does not believe that future decisions by any of the project sponsors to invest in other projects in Alberta will be significantly

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[1] "Captive" customers, unlike "merchant" customers are affiliated with a styrene producer.

[2] All dollar amounts in this section are expressed in constant 1980 dollars.

TABLE 5 BOARD FORECAST ECONOMIC IMPACT OF PROPOSED
STYRENE PLANTS ON ALBERTA
millions of constant [illegible] dollars

	1 AEC/ESSO	2 SHELL/NOVA
Total Costs and Revenues		
Revenue from Sales	[illegible]	[illegible]
Expenditures		
Construction Costs	190	190
Operating Costs	125	[illegible]
Interest	[illegible]	[illegible]
Municipal Taxes	15	20
Raw Material and Fuel	[illegible]	[illegible]
Total	[illegible]	[illegible]
Net Income Before Tax	[illegible]	[illegible]
Income Taxes		
Provincial	[illegible]	[illegible]
Federal	[illegible]	[illegible]
Total	[illegible]	[illegible]
Net Income After Tax	[illegible]	[illegible]
Impact on Alberta		
Direct Impact		
Construction Costs	141	[illegible]
Operating Costs	[illegible]	[illegible]
Net Income	[illegible]	[illegible]
Taxes	[illegible]	[illegible]
Total	[illegible]	[illegible]
Indirect Impact	[illegible]	[illegible]
Total Impact	[illegible]	[illegible]

Note: The foregoing analysis assumes consumption of [illegible] as applied for by [illegible] and as indicated by AEC/Esso in correspondence subsequent to the hearings.

affected by the fate of the projects applied for. In any case earnings (retained or otherwise) are benefits accruing to shareholders who may or may not be Albertans. Since Shell/NOVA did not present an estimate of operating costs exclusive of fuel and feedstock, the AEC/Esso figure was adjusted for scale and used as the Board's estimate of Shell/NOVA operating costs.

The Board finds both projects to be commercially viable and attractive from an Alberta point of view. The direct incremental impact on Alberta reflects the expenditure pattern of both projects due to the source of construction and operating expenditures, the generation of provincial and municipal taxes, and the benefit of retained earnings vested with Alberta shareholders in the proposed companies. No credit is given to reinvestment of federal taxes in Alberta since it is questionable that this would actually occur. In total, the analysis shows both the projects will generate real expenditures during their life time ranging from $1 to $2 billion in Alberta.

6 DECISION

6.1 AEC/Esso

The Board finds that AEC/Esso's proposal represents an efficient use of energy resources, and that the proposed project is in the public interest of Alberta having regard for present and future availability and efficient use of energy resources, and for other matters. Accordingly, the Board is prepared, with the approval of the Lieutenant Governor in Council, to issue the requested permit to AEC/Esso. The permit would authorize the maximum annual use of 131 million cubic metres of gas, 313 900 tonnes of benzene, and 113 900 tonnes of ethylene in the production of 400 000 tonnes of styrene monomer in a plant near Bruderheim. The permit would be in the form shown in Appendix 1, and be subject to all the terms and conditions contained therein as well as to any conditions imposed by the Lieutenant Governor in Council.

6.2 Shell/NOVA

The Board finds that Shell/NOVA's proposal represents an efficient use of energy resources, and that the proposed project is in the public interest of Alberta having regard for present and future availability and efficient use of energy resources, and for other matters. Accordingly, the Board is prepared with the approval of the Lieutenant Governor in Council, to issue the requested permit to Shell/NOVA. The permit would authorize the maximum annual use of 146 million cubic metres of gas, 260 000 tonnes of benzene, and 98 000 tonnes of ethylene in the production of 345 000 tonnes of styrene monomer in a plant near Scotford. The permit would be in the form shown in Appendix 2, and be subject to all of the terms and conditions contained therein as well as to any conditions imposed by the Lieutenant Governor in Council.

DATED at Calgary, Alberta on 23 February 1981.

ENERGY RESOURCES CONSERVATION BOARD

N. Berkowitz, P.Eng.
Vice Chairman

V.E. Bohme

V. E. Bohme, P.Eng.
Board Member

F. J. Mink, P.Eng.
Acting Board Member

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit to Alberta Energy Company Ltd. and Esso Chemical Canada authorizing the use of ethylene, benzene and gas produced in Alberta for the production of styrene monomer.

INDUSTRIAL DEVELOPMENT PERMIT NO. AEC/ECC 81-1

WHEREAS Alberta Energy Company Ltd. and Esso Chemical Canada have applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42 of The Oil and Gas Conservation Act, authorizing the use of ethylene, benzene, and gas produced in Alberta for the production of styrene monomer in Alberta; and

WHEREAS the Board, upon inquiry into the application, is of the opinion that the granting of this industrial development permit for the use of ethylene and benzene as raw material and natural gas as fuel in the production of styrene monomer is in the public interest having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council has given his approval, by Order in Council, numbered O.C. and dated , 19 authorizing the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to Alberta Energy Company Ltd. and Esso Chemical Canada (hereinafter called the "Permittees") authorizing the use of ethylene and benzene as raw material and natural gas as fuel in the production of styrene monomer subject to the regulations and orders made pursuant to the Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use in Alberta by the Permittees of ethylene and benzene as raw material and gas as fuel in the production of styrene monomer, generally as described in the application of the Permittees, dated October 24, 1980.

2. The plant shall be located in Section 35, Township 55, Range 10, West of the Fourth Meridian.

3. Subject to the conformity by the Permittees with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on December 31, 2004.

4. The quantity of ethylene, benzene and gas that may be used per calandar year in the industrial operation referred to herein shall not exceed

(a) 113 900 tonnes of ethylene as raw material,

(b) 313 900 tonnes of benzene as raw material,

(c) 131 million cubic metres of gas as fuel.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37.4 megajoules per cubic metre.

6. All ethylene, benzene and gas used in producing styrene monomer pursuant to this permit shall be measured by or on behalf of the Permittees and shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittees shall obtain the approval of the Board of any major changes in design of the facility.

8. (1) The Permittees shall satisfy the Board prior to __________________ as to the arrangements that have been made for the supply of ethylene, benzene, and gas to be used in the proposed project.

(2) The Permittees shall satisfy the Board prior to ______, that arrangements for the financing of the proposed project have been completed.

(3) The Permittees shall satisfy the Board prior to ________, that construction of the proposed project has commenced and that construction of the proposed facilities will continue in accordance with the schedule described in the application dated October 24, 1980.

(4) During the construction of the proposed project, the permittees shall inform the Board, on a semi-annual basis, of the progress of construction.

(5) Notwithstanding the dates prescribed in clause 8, subclauses (1), (2), (3), the Board upon application of the Permittees, may prescribe later dates.

9. The Permittees shall operate the facilities in a manner that results in

(a) the maximum practically obtainable efficiency in the use of ethylene, benzene, and gas for the manufacture of styrene monomer, and

(b) the maximum practical conservation of ethylene, benzene, and gas.

10. The Permittees shall not

(a) assign this permit, or

(b) release from their control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

11. (1) Attached hereto as Appendix A and made part of this permit, is the Order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the Order of the Lieutenant Governor in Council set out in Appendix A.

12. Where it appears to the Board or the Lieutenant Governor in Council that the Permittees have contravened or failed to comply with any term or condition contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and, with the approval of the Lieutenant Governor in Council, may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

(b) the Lieutenant Governor in Council may amend, vary, add to, or replace any terms or conditions contained in this permit.

13. Notwithstanding the provisions hereof, the Permittees shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of energy resources within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

N. Berkowitz
Vice Chairman

Attachment I to O.C. No. __________

Pursuant to section 42(6)(b) of The Oil and Gas Conservation Act, the order of the Lieutenant Governor in Council authorizing the issuance of an industrial development permit by the Energy Resources Conservation Board to Alberta Energy Company Ltd. and Esso Chemical Canada (hereinafter called "the Permittees") is subject to the following terms and conditions:

1. The Permittees shall satisfy the Minister of Economic Development prior to ________________ and thereafter throughout the term of the permit, with respect to the use wherever practicable in the project, of Alberta engineering and other professional services, and Alberta tradesmen and other construction personnel, equipment, materials and supplies from Alberta.

2. The Permittees shall satisfy the Minister of Energy and Natural Resources, prior to ______________, with respect to the price to be paid for the energy resources used in the project.

Appendix to Recommendation for

Order in Council

Draft of O.C.

Upon the recommendation of the Honourable the Minister of Energy and Natural Resources, the Lieutenant Governor in Council, pursuant to section 42(3) of The Oil and Gas Conservation Act, authorizes the Energy Resources Conservation Board to issue an industrial development permit to Alberta Energy Company Ltd. and Esso Chemical Canada in the form attached hereto and subject to the terms and conditions set out in Attachment I attached hereto.

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit to Shell Canada Limited and NOVA, AN ALBERTA CORPORATION authorizing the use of ethylene, benzene and gas produced in Alberta for the production of styrene monomer

INDUSTRIAL DEVELOPMENT PERMIT NO. S/N 81-1

WHEREAS Shell Canada Limited and NOVA, AN ALBERTA CORPORATION have applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42 of The Oil and Gas Conservation Act, authorizing the use of ethylene, benzene, and gas produced in Alberta for the production of styrene monomer in Alberta; and

WHEREAS the Board, upon inquiry into the application, is of the opinion that the granting of this industrial development permit for the use of ethylene and benzene as raw material and gas as fuel in the production of styrene monomer is in the public interest having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council has given his approval, by Order in Council, numbered O.C. and dated has authorized the granting of this permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to Shell Canada Limited and NOVA, AN ALBERTA CORPORATION (hereinafter called "the Permittees") authorizing the use of ethylene and benzene as raw material and natural gas as fuel in the production of styrene monomer subject to the regulations and orders made pursuant to the said Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use in Alberta by the Permittees of ethylene and benzene as raw material and natural gas as fuel in the production of styrene monomer, generally as described in the application of the Permittees dated September 12, 1980.

2. The plant shall be located in the North-east quarter of Section 30, the East half of Section 31 and all of Section 32, all in Township 55, Range 21, West of the 4th Meridian, and the south-east quarter of Section 6 and the South half of Section 5, all in Township 56, Range 21, West of the 4th Meridian.

3. Subject to the conformity by the Permittees with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on December 31, 2004.

4. The quantity of ethylene, benzene and natural gas that may be used per calendar year in the industrial operation referred to herein shall not exceed

(a) 260 000 tonnes of benzene as raw material,

(b) 98 000 tonnes of ethylene as raw material,

(c) 146 million cubic metres of natural gas as fuel.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37.4 megajoules per cubic metre.

6. All ethylene, benzene, and gas used in producing styrene monomer pursuant to this permit shall be measured by or on behalf of the Permittees and shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittees shall obtain the approval of the Board of any major changes in design of the facility.

8. (1) The Permittees shall satisfy the Board prior to ____, as to the arrangements that have been made for the supply of ethylene, benzene, and gas to be used in the proposed project.

(2) The Permittees shall satisfy the Board prior to ________ that arrangements for the financing of the proposed project have been completed.

(3) The Permittees shall satisfy the Board prior to ____________________, that construction of its proposed project has commenced and that construction of the proposed facilities will continue in accordance with the schedule described in the application dated September 12, 1980.

(4) During the construction of the proposed project, the Permittees shall inform the Board, on a semi-annual basis, of the progress of construction.

(5) Notwithstanding the dates prescribed by clause 9, subclauses (1), (2), (3), the Board, upon application of the Permittees, may prescribe later dates.

9. The Permittees shall operate the facilities in a manner that results in

(a) the maximum practically obtainable efficiency in the use of ethylene, benzene, and gas for the manufacture of styrene monomer, and

(b) the maximum practical conservation of ethylene, benzene and gas

10. The Permittees shall not

(a) assign this permit, or

(b) release from their control the operation of the plant,

without consent in writing of the Board which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

11. (1) Attached hereto as Appendix A and made part of this permit is the Order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the Order of the Lieutenant Governor in Council set out in Appendix A.

12. Where it appears to the Board or the Lieutenant Governor in Council that the Permittees have contravened or failed to comply with any terms or conditions contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and with the approval of the Lieutenant Governor in Council may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

(b) the Lieutenant Governor in Council may amend, vary, add to, or replace any terms or conditions contained in this permit.

13. Notwithstanding the provisions hereof, the Permittees shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of energy resources within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

N. Berkowitz
Vice Chairman

Attachment I to O.C. No. ________

Pursuant to section 42(6)(b) of The Oil and Gas Conservation Act, the order of the Lieutenant Governor in Council authorizing the issuance of an industrial development permit by the Energy Resources Conservation Board to Shell Canada Limited and NOVA, AN ALBERTA CORPORATION (hereinafter called the Permittees) is subject to the following terms and conditions:

1. The Permittees shall satisfy the Minister of Economic Development prior to ________________ and thereafter throughout the term of the permit, with respect to the use wherever practicable in the project, of Alberta engineering and other professional services, and Alberta tradesmen and other construction personnel, equipment, materials and supplies from Alberta.

2. The Permittees shall satisfy the Minister of Energy and Natural Resources, prior to ______________, with respect to the price to be paid for the energy resources used in the project.

Appendix to Recommendation for

Order in Council

Draft of O.C.

Upon the recommendation of the Honourable the Minister of Energy and Natural Resources, the Lieutenant Governor in Council, pursuant to section 42(3) of The Oil and Gas Conservation Act, authorizes the Energy Resources Conservation Board to issue an industrial development permit to Shell Canada Limited and NOVA, AN ALBERTA CORPORATION in the form attached hereto and subject to the terms and conditions set out in Attachment I attached hereto.

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

DOME PETROLEUM LIMITED
LICENCES TO DRILL WELLS
WEMBLEY FIELD

Decision 81-4
Applications 800795
and 800796

The Board has reviewed the report of its examiners, attached hereto, and their recommendations on the applications of Dome Petroleum Limited for licences to drill two prospective oil wells. The Board accepts the evidence as summarized by the examiners and, subject to the following comments, agrees with the recommendations. The Board's further comments and conclusions respecting the matters dealt with in the examiners' report and identified therein as "The Issues" are as follows:

1 Respecting Item 4.1 in the examiners' report, the location of equipment and pits, the Board recognizes the reasons for the landowners concerns respecting the specific location of certain major facilities or land disturbances on a proposed well site. The Board agrees with the examiners' recommendation 2 on page 13 of their report, that in the particular instance before the Board, Dome be directed to confer with the landowners respecting a suitable battery location and report on the results of these negotiations when applying for approval of the batteries. If agreement cannot be reached respecting facility locations, the Board would expect to make further directions as appropriate.

The Board also agrees with the examiners that one method of handling this concern respecting the location of major production equipment might be through a regulation change requiring that the landowners' consent be obtained respecting the construction plans outlined in a battery application. However, the Board is not convinced that such an approach would be the most appropriate on a province-wide basis and would wish to have further input as to other actions which might be taken to deal with concerns of this nature. As a result of this problem, and others to be addressed later in this report, the Board believes it should arrange for a small committee to review the matter and to report to it on the severity of the problem and appropriate methods of dealing with it. The Committee would include representatives from the Agricultural Community, the oil and gas industry, and concerned government departments and agencies. The Board will be announcing further details respecting this Agriculture-Petroleum-Government review committee in the near future.

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2 With respect to part 4.2 of the examiners' report, the Board agrees with the examiners' views respecting the maintenance of well site topography. The Board does note however, that with proper consultation respecting the site location and also the matters reported on in part 4.1 of the report, the need for major changes to the topography on a well site would likely be considerably lessened.

3 With respect to the handling of waste material as reported on in part 4.3 of the examiners' report, the Board agrees with the examiners that this matter is covered by section 8.160 of the regulations. Under this regulation, waste material must be properly disposed of. The Board recognizes that the question of whether certain kinds of waste materials should be disposed of in pits is a special problem. It intends to refer this matter to the previously mentioned Agriculture-Petroleum-Government committee.

The Board notes that there are many thousands of well sites in the province and it is not practical that the inspection staff visit all sites on a frequent basis. For this reason, the Board would suggest to landowners that where it appears that waste material is not being adequately disposed of, the well operator should be contacted as soon as possible. If this does not result in the matter being looked after, the Board would expect the landowner to contact the appropriate Board field office and report the matter. For convenience the location and telephone numbers of the Board's field offices are attached to this report.

4 With repect to part 4.5, the burial of electric lines, the Board agrees with the examiners that in the particular cases being dealt with, there is no need to bury the power lines in that there does not appear to be any particular interference on the part of the power lines with agricultural operations. The Board also agrees with the examiners that in other instances where a line would cause interference with farming operations, underground burial might be appropriate. For this reason, the Board intends to refer the policy question of burial of electric lines to the Agriculture-Petroleum-Government review committee referred to in Item 1 of this report.

5 Respecting the containment and disposition of drilling fluids as reported on in part 4.6 of the examiners' report, the Board notes the examiners' statement that policies in this regard are under view by Alberta Environment, Alberta Energy & Natural Resources, the Board and industry. The Board believes that input respecting this problem from the agricultural community would be appropriate and accordingly intends to refer the matter to the review committee referred to earlier in the report.

With respect to the specific Dome applications before the Board, it agrees with the examiners' view that on-site disposal in the currently accepted manner is appropriate.

6 With respect to part 4.7 of the examiners' report, the Board notes that the practice to date has been such that an operator could conceivably obtain a second licence to drill a second well on the same well-site without the knowledge of the landowner. The Board intends to change this policy effective immediately so that a landowner must be consulted prior to the issuance of a well licence even if the second well is to be drilled on the surface lease granted for an earlier well.

The Board notes that the concern respecting the number of wells which may be drilled under a well licence appears to relate as much to water wells as to second wells targeted for deeper formations and oil or gas. The Board notes the statement of the examiners that shallow water wells are beyond the Board's jurisdiction and indeed there is some uncertainty in the Board's mind as to whether or not regulatory controls exist with respect to such wells. The Board intends to review this matter with other government departments and, to the extent practical, hopes to ensure that this matter is properly controlled.

7 With respect to part 4.8 of the examiners' report, the flaring of gas at well sites, the Board generally agrees with the examiners' views. It does however, believe that it would be appropriate to elaborate on some of the matters mentioned by the examiners. Wells in the area would produce only that gas in solution in the oil in the reservoir, which is a relatively limited amount. Indeed, a review of the situation suggests that the typical well would produce only approximately 278 270 cubic feet (7840 cubic metres) of gas per day. The H_2S in the produced gas would be only some 4969 cubic feet (140 cubic metres). The Board requires that this gas be burned so that the H_2S is converted to sulphur dioxide (SO_2) prior to its release to the atmosphere. Additionally, the Board requires

that the release be such that the ground-level concentration standards of .17 ppm as a one-hour concentration be met. In this region, the volumes of H_2S in the gas are such that the ground-level concentration standards are easily satisfied provided the gas is flared prior to its release. Since evidence at the hearing suggests that there have been problems respecting continually burning flares, the Board would require that Dome Petroleum and other operators in the area install appropriate pilots or ignition devices to ensure continuous burning. If landowners encounter situations where flares have gone out, the Board would suggest that the operator be contacted immediately. If this does not result in the problem being rectified the Board would ask that the landowner contact the appropriate Board office.

The Board would also like to emphasize that flaring of these relatively small volumes of gas occurs only so long as there are not dangers relative to the amount of sulphur contained in the gas and only if the gathering and conservation of the gas is not economic. The Board keeps an on-going surveillance respecting the volumes of gas being flared and when feasible, would order the operator to gather and conserve the gas.

The Board also recognizes that lengthy delays prior to centralizing batteries makes this situation worse than it might otherwise be and the Board intends to pursue this matter, and where possible, take measures to shorten the elapsed time during which single-well batteries would be in operation.

8 In part 4.9 the examiners have indicated that the question of jurisdiction respecting access roads is presently being addressed by the Board. The Board wishes to confirm that it has indeed recommended legislative changes which would give it jurisdiction respecting the location and method of construction of access roads. Additionally, and in anticipation that it will be given jurisdiction respecting these matters, the Board intends to ask the review committee referred to earlier in this report, to study and report on the question of access roads.

9 Respecting part 4.10 of the examiners' report the location of campsites, the Board agrees with the general view expressed by examiners that a well site would not be an appropriate location for a camp. The Board wishes to emphasize that it believes any residential dwelling which is likely to be occupied on a more or less continuous basis should be at least 100 metres from the location of a well. The Board believes that such a minimum

separation distance would be appropriate for campsites in that they too are occupied on essentially a full time basis. In stating this conclusion, the Board distinguishes between a dwelling or site which is likely to be occupied on a continuous basis and occasional visits to a well site by oil well operators, landowners or others.

10 In part 4.11 of the examiners' report the examiners have dealt with the question of weed control. The Board recognizes the concern of landowners respecting this matter but confirms the examiners' statement that certain aspects respecting weed control are beyond the Board's jurisdiction. The Board does note that there are municipal weed inspectors and also that the Land Surface Reclamation Council has some involvement respecting the matter of weeds. The Board intends to ask the review committee which it is formulating to look at this problem and to make recommendations, if necessary, respecting the appropriate assignment of jurisdiction. The Board does wish to emphasize its view that it believes an essential ingredient in the matter of weed control on oil well leases is an extensive degree of cooperation between the oil well operator and the landowners.

Subject to the above comments, the Board accepts the recommendations of the examiners that the subject applications be approved. The Board will require, in addition to the conditions recommended by the examiners, that the wells be equipped with suitable pilots or ignition devices to ensure that flares do not go out. The Board also wishes to emphasize the conclusion of the examiners that this proceeding, and many other similar ones, have demonstrated to the Board a need for increased communication and negotiation between the oil and gas industry and the agricultural community.

DATED at Calgary, Alberta on 13 March 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy
Vice Chairman

ENERGY RESOURCES CONSERVATION BOARD
Calgary, Alberta

DOME PETROLEUM LIMITED
LICENCES TO DRILL WELLS
WEMBLEY FIELD

Examiners' Report
Applications 800795
and 800796

1 INTRODUCTION

1.1 The Application and Hearing

Dome Petroleum Limited (Dome) applied pursuant to the provisions of The Oil and Gas Conservation Act for licences to drill wells in legal subdivision 6 of section 16, and legal subdivision 6 of section 17 both in township 73, range 8 west of the 6th meridian to evaluate and obtain production from the Halfway Formation.

The applications were considered concurrently at a public hearing in Grande Prairie on 27 November 1980, with L. A. Bellows, P.Eng., L. A. Mazurek, P.Eng. and M. Bruni, sitting.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Dome Petroleum Limited (Dome)	
R. Swist	T. McGlynn O. Dusterhoft B. Trickett, P.Eng. W. Brown
R. G. Driedger M. Richards	R. G. Driedger M. Richards
J. D. Carter	C. Penson R. Harpe A. Dommer
Energy Resources Conservation Board (Board staff)	
J. R. Nichol, P.Eng. D. L. Skappak	

1.2 The Intervention

In its opening remarks, Dome made specific reference to the fact that the interveners had not filed a written submission in response to the Board's notice of hearing. Dome was concerned that it did not know what the interveners' position and concerns were in regard to this matter and, therefore, wanted to know what evidence the intervener intended to introduce at the hearing.

Mr. Carter, on behalf of the interveners, indicated that he intended to introduce his letter of 25 September 1980, to Mr. D. L. Skappak, Supervisor, Well Licensing, Energy Resources Conservation Board, plus one or two additional items which he intended to include in his opening remarks, as his intervention to this hearing. Mr. Carter did, however, indicate that he had not sent a copy of this letter to the applicant.

It was subsequently determined that Dome had received a copy of the subject letter, through the Board staff, and that it was therefore prepared to proceed with the hearing.

The examiners are concerned that departures from the Board's Rules of Practice, due in part to the participation of parties not familiar with these rules, may lead to unnecessary adjournments of hearings. In this case the hearing was called at the request of the interveners and the interveners failed to file a submission in response to the notice of hearing. Only the fact that the applicant had obtained a copy of the interveners' letter from Board staff and was willing to proceed avoided either an adjournment of the hearing or a continuance of the hearing without further consideration of the intervention.

2 METHOD OF DISPOSITION

2.1 The Applicant's Views

Dome submitted that regardless of which government body might ultimately have jurisdiction over the conditions as outlined by the interveners, the important consideration is the legal rights of the lease holder. Once the appropriate agreement has been signed or an order issued, the oil company has the legal right to do whatever it wants with the entire well site area as long as those actions comply with the existing regulatory Acts and Regulations. Dome did, however, indicate that it does recognize the concerns of the surface rights holder and it does try to work with the landowner whenever possible.

The applicant submitted that conditions similar to those requested by the intervener had already been ruled upon by the Surface Rights Board in Decision E103/80 and that those areas of concern not within the jurisdiction of the Surface Rights Board were already adequately covered by existing legislation under The Oil and Gas Conservation Act and Regulations.

Dome, therefore, submitted that it was neither necessary nor appropriate to condition any well licence with any of the items outlined in the intervention.

2.2 The Interveners' Views

The interveners stated that in their opinion, all the conditions requested were clearly within the jurisdiction of the Energy Resources Conservation Board and therefore should be treated accordingly.

The interveners believed that the conditions requested in their letter and other conditions requested at the hearing were not adequately covered by existing legislation and/or specific directions or rulings from the various government regulatory agencies. The interveners argued that past landowner experience, in negotiating lease agreements with oil companies, indicated that appending these items as conditions to the well licence was necessary to ensure that their concerns would ultimately be resolved. In their view, the conditioning of the well licences was the only way to ensure that the required action would actually be implemented.

2.3 The Examiners' Views

The examiners believe that, in areas where the Board has jurisdiction, it may place conditions on well licences where appropriate. However, it is not necessary to place conditions on well licences where the subject is already adequately included in existing regulations.

3 THE ISSUES

The need for and the specific location of the applied for wells was not questioned by the interveners. The issues are therefore the well licence conditions requested by the interveners in their letter of 25 September 1980 and the additional conditions requested orally at the hearing. These are:

a location of equipment and pit(s),
b maintenance of the well site topography,
c handling of waste material disposal,
d restriction of access by unauthorized persons,
e burial of electrical lines,
f the appropriate method of containing and disposing of drilling fluids,
g the restriction of the number of wells drilled under a given well licence,
h the flaring of gas at the well site,
i the method of construction of the access road and its location within the right of way,
j the location of camp sites, and
k the method of weed control.

4 THE NEED FOR SPECIFIC CONDITIONS

4.1 Location of Equipment and Pits

4.1.1 The Applicant's Views

Dome stated that the usual production facility would comprise three or four production tanks, an emergency tank, and a small metal building containing a separator and meters. Gas produced with the oil would be flared in a pit. After examining the well site survey plans, Dome stated that it appeared that the production equipment could be placed in the corners of the quarter sections and meet Board equipment spacing regulations, but that this would be subject to confirmation that the topography of each site was suitable. Dome also stated that the sump could likely be placed in the corner provided the site was relatively level, but that the sump had to be constructed on the high side of the site in order to meet Board requirements. The applicant stated that it is its policy to confer with the owner to determine whether he has special requirements which would facilitate the owner's operation.

4.1.2 The Interveners' Views

The interveners stated that the most desirable location for production equipment would be on the inside corner of the well sites to minimize the impact on farming operations and the waste of farm land, and that such arrangements should be part of the company's procedure in dealing with the landowner. They also stated that the site should not be fenced since it is desired to farm as close to the installation as possible.

4.1.3 The Examiners' Views

The examiners note that Section 7.001 of the Oil and Gas Conservation Regulations (the Regulations) require an operator to apply to the Board for approval of the location and construction of a battery (production facilities) prior to commencement of construction. At this time there is not a requirement that the landowner consent to the construction plans.

The examiners believe that the Regulations concerning battery construction should be expanded to provide for input by those whose rights may be affected, in particular the owner or occupant of the land on which a battery is proposed, regardless of the fact that an operator may hold a surface lease or right of entry order on the proposed site. This would appear to be a better solution than imposing conditions on a well licence.

In the applications being considered, the examiners agree that the corner locations appear to be desirable sites for the batteries, but note that no conclusive evidence was available that the topography of the corner locations is suitable. The examiners believe that a decision on battery locations should be deferred and that the applicant be directed to determine suitable locations, confer with the landowner, and report the results of those investigations to the Board when applying for battery approvals.

Regarding the interveners desire to farm the unused parts of the well sites, the examiners do not believe that the Board has jurisdiction to direct the applicant to make such land available solely for farming purposes. While the examiners endorse the concept of maximum utilization of farm land, conditions for the use of part of the well site by the landowner would have to be settled by negotiation.

4.2 Maintenance of the Well Site Topography

4.2.1 The Applicant's Views

Dome stated that, although none of its witnesses had examined the proposed well sites, construction would not interfere with any natural water courses, and it would construct road culverts and ditches as necessary to maintain natural drainage. It did not comment on the need for other levelling.

4.2.2 The Interveners' Views

The interveners stated that top soil stripping should be kept to a minimum, and that some compaction of top soil is preferable to mixing it with clay. They believed that levelling of well sites should be restricted to the area required for the drilling rig, both to conserve top soil and to reduce interference with drainage.

4.2.3 The Examiners' Views

The examiners recognize that there may be a difference of opinion with respect to top soil damage caused by compaction as compared to the detrimental effects of stripping. However they believe that, where either method is feasible, the landowner's preference should be followed.

Where levelling of a well site is necessary to accommodate the drilling rig, access for heavy equipment, a flare pit, material storage and mud tanks or pits, some top soil stripping is unavoidable if the top soil is to be preserved. The examiners do not believe it practical or possible for the Board to specify the amount of levelling which will be permitted. They believe that this must be left to the discretion of the licensee in order that it may discharge its responsibilities with respect to safe drilling operations.

4.6.3 The Examiners' Views

The examiners note that Dome's proposed on-site mud disposal program meets the requirements set out in the Board's Interim Directive ID-OG 75-2 in that the sumps are expected to contain less than 6000 barrels of fluid and the leases are more than 300 feet from water. On-site disposal of mud has been practised in Alberta for many years and the requirements in the directive have been in effect since July 1975. The directive has been under review by Alberta Environment, Alberta Energy and Natural Resources, the Board and industry and some revision is being considered however no significant changes are contemplated for the on-site disposal criteria. The examiners believe that on-site disposal is an acceptable method and that it can be employed on the proposed sites with little effect on long term productivity.

The examiners agree with the interveners that final levelling and return of top soil should not be attempted until the sump and ditches have compacted and settled, however, the time required for settling will vary with sump volume, climate and soil characteristics. The examiners believe that, rather than assigning an arbitrary three-year time before reclamation, the licensee should select an appropriate time and consult with the landowner before proceeding. The examiners also note that final reclamation when the site is to be returned to the owner is subject to approval by the Land Surface Reclamation Council.

4.7 The Number of Wells Drilled Under a Given Well Licence

4.7.1 The Applicant's Views

Dome stated that it could drill only one well under each Board licence and that it did not intend to drill any water wells at the proposed sites.

4.7.2 The Interveners' Views

The interveners stated that a licence should be restricted to one well, in order that the landowner would know what he was dealing with. They were concerned with the possibility that the applicant could drill water wells on the well sites without obtaining any further approvals. The concerns were due to the presence of some artesian flows which have been encountered in the area and which have caused flooding of fields.

4.7.3 The Examiners' Views

Only one well can be drilled under each of the two licences applied for by Dome. Since Dome has stated that no water wells will be drilled on the proposed sites, the examiners do not believe any action by the Board is required.

The examiners believe it is appropriate that they bring to the attention of the Board that water wells shallower than 150 metres drilled to supply rig or camp water are not within the Board's jurisdiction. Also section 2.020(4) of the Regulations requires an applicant to "furnish evidence of any right to access to the land surface". Conceivably, under present practice, an operator could apply to the Board for a second licence to drill another well on the same well site and could receive a licence without the knowledge of the landowner. Normally, however, some additional land is required and therefore the consent of the landowner must be sought.

4.8 Flaring of Gas at the Well Sites

4.8.1 The Applicant's Views

As stated in section 4.1.1 Dome intends to flare the solution gas in a pit, not in a flare stack. A stack would not normally be required by Board regulation, since the gas contains less than 10,000 parts per million hydrogen sulphide. Also the gas could not be piped to existing batteries for flaring due to the operating problems which would be encountered. Dome stated that the presently planned single well batteries would likely be replaced within two years by a central battery, after development has defined the producing area, and at that time all gas would be flared at the battery. Dome stated that some problem has been encountered with flare outage, but it did not have any plans to install ignition devices.

4.8.2 The Interveners' Views

The interveners stated that there have been odour problems in the general area due to flared or released gas from well sites and expressed concerns regarding safety, effect on crops and nuisance. They maintained that the gas should be piped to a scrubbing station somewhere else where it will not be a nuisance or hazard to themselves. Until such facilities are installed the interveners believe that the two subject wells should not be placed on production.

4.8.3 The Examiners' Views

The examiners note that flaring of relatively small volumes of gas produced in association with oil, at both single well and central processing facilities, has been and is common practice. The Board monitors flaring and would require that gas produced unavoidably with oil be conserved when sufficient volume is available for a feasible conservation scheme.

No significant hazards are associated with the flaring provided facilities are properly designed and operated. Design is reviewed by Board staff when a battery application is submitted and operation is checked by field staff after the battery is constructed. Problems such as odours caused by flare outage are investigated by Board staff when they are reported. Equipment modifications may be required and contravention of pollution control regulations may result in a battery being shut in. In view of the above the examiners do not consider it appropriate to recommend that the two wells be shut in until facilities are installed to gather and scrub the solution gas.

4.9 Method of Construction and Location of Access Roads Within the Right of Way

4.9.1 The Applicant's Views

Dome stated that its lease roads are built so as to give ready access to the well site in all weather. If drilling were to be delayed until freeze-up, a trail would be used for drilling access and a road constructed the following spring.

4.9.2 The Interveners' Views

The interveners requested that the roads to the proposed well sites, which run along the half-section lines, be constructed immediately along the fence line with no strips of 20 or 30 feet between the road and the fence, and that removed top soil be piled on the field side of the road. The positioning of the road in this manner would leave part of the right of way available for farming. They also requested that the road be so constructed that farm equipment can travel back and forth from the road to the field for operations such as spraying.

4.9.3 The Examiners' Views

The examiners do not believe that the Board has jurisdiction over the placement of the road within the right of way or the road design. The examiners understand that this question of jurisdiction is presently being addressed by the Board.

The examiners believe that the landowner should be consulted regarding top soil stripping, and if top soil is to be stored on the field side then the road, on an 18 metre right of way, would have to be constructed very close to the quarter section boundary. The examiners question whether an all-weather road could be constructed, with top soil stored on the field side, and still maintain a profile that would enable farm equipment to move easily between road and field.

4.10 Location of Camp Sites

4.10.1 The Applicant's Views

Dome stated that a drilling camp site to house 25 to 30 men could not be safely accommodated on its existing, producing well site in 9-17-73-8. It stated that camp site location is discussed with the landowner.

4.10.2 The Interveners' Views

The interveners stated that other drilling camp sites have been placed adjoining the drill sites, and indicated that the existing well site in 9-17-73-8 would be, in their view, a preferred camp location. No other camp sites were proposed.

The interveners also stated that it seems location of camp sites should be within the jurisdiction of the Surface Rights Board, but they would like to have the matter of jurisdiction clarified.

4.10.3 The Examiners' Views

The examiners do not believe that the Board has jurisdiction over camp site location. The examiners are aware that the Surface Rights Board includes the camp site in its decisions where such cannot be agreed on by way of negotiation.

With regard to the interveners suggestion that a nearby producing well and battery site be used as a camp site, the examiners agree with Dome's opinion that such a location is not suitable for a camp.

The examiners recognize, as was stated in section 4.8, that there are no significant hazards associated with production of wells and flaring of gas when this occurs at least 100 metres from the nearest residences. The location of a camp site adjacent to the well and battery site, as suggested by the interveners would be within 100 metres and accordingly unsuitable.

4.11 Method of Weed Control

4.11.1 The Applicant's Views

Dome stated that in many cases the landowner farms the unused part of the well site and assumes responsibility for weed control. Where the landowner does not wish to farm part of the site, Dome would fence the site and apply a soil sterilant.

4.11.2 The Interveners' Views

The interveners stated that weeds should be controlled on unused well site areas by planting with registered seed, the registered seed being stipulated to avoid bringing in weeds. This requirement should apply to areas where mud sumps and trenches have been left to consolidate and settle for a three-year minimum period as discussed in part 4.6.

4.11.3 The Examiners' Views

Although weed control may be covered in a broad manner by Section 8.150(6) of the Regulations, which requires that the well site be maintained in a clean condition, such regulation is primarily for safety purposes and general housekeeping. The interveners' request that unused areas be seeded to a registered forage seed is not within the purview of Section 8.150(6), and accordingly is not within the Board's jurisdiction to require.

The examiners also note that weed control is not an area in which Board field staff have any expertise. The Land Surface Reclamation Council members are knowledgeable in this area and in the past have inspected sites on the landowner's request.

ENERGY RESOURCES CONSERVATION BOARD
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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

ENHANCED RECOVERY
WESTPEM NISKU A
CHEVRON STANDARD LIMITED

Decision 81-5
Application 800163

1 INTRODUCTION

Chevron Standard Limited applied pursuant to section 38 of The Oil and Gas Conservation Act for approval of an enhanced recovery scheme by water injection in the Westpem Nisku A Pool (A Pool). The Board staff recommended that a hydrocarbon miscible flood be implemented instead. The hearing was thus called to consider the application for waterflood and to permit Chevron to show cause why a hydrocarbon miscible flood should not be implemented.

1.2 The Hearing

A public hearing was held on 2 December 1980 with G. J. DeSorcy, P.Eng., N. Strom, P.Eng., and F. J. Mink, P.Eng. sitting. Participants at the hearing are listed in Table 1. Amoco filed an intervention for purposes of cross-examination only.

TABLE 1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in the Report)	Witnesses
Chevron Standard Limited (Chevron) R. Pashelka	L. D. Mann, P.Eng. E. C. Sakundiak, P.Eng. J. D. Scott, P.Eng.
Amoco Canada Petroleum Limited (Amoco) G. Baugh J. McLeod, P.Eng.	
Energy Resources Conservation Board staff (Board Staff) D. Holgate R. J. Willard, P.Eng.	P. M. Stanton, P.Eng. R. J. Willard, P.Eng. G. M. Warren

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1.3 Background

The Westpem Nisku A Pool was discovered in August 1977 with the drilling of the well Chevron Pembina 1-9-50-12 W5M and further defined with the completion of the well Chevron Pembina 16-4-50-12 W5M. The pool is an isolated pinnacle reef, does not have an oil/water interface and as typical of other pools in the West Pembina basin does not appear to be connected to an active aquifer. As a result, the reservoir pressure has declined rapidly from an initial pressure of 38 300 kPa to a bubble point pressure of 20 884 kPa.

Pursuant to provisions of IL 79-24 the operator has been allowed to continue production from the pool at a curtailed rate pending implementation of enhanced recovery operations. The question at hand is whether that recovery mechanism is to be simply a waterflood or a potentially more efficient miscible flood.

2 ISSUES

The Board recognizes that some form of enhanced recovery will be necessary and essentially agrees with the applicant's description of basic reservoir characteristics and estimates of oil in-place. The Board therefore considers the major issue to be water flooding versus miscible flooding including consideration of:

(i) potential net conservation gains, and
(ii) associated economics.

3 WATERFLOOD VERSUS MISCIBLE FLOOD POTENTIAL NET CONSERVATION GAINS

Views of Chevron

Chevron estimated a waterflood recovery of 62.6 per cent assuming a residual oil saturation (Sor) of 27.5 per cent as determined from displacement tests on four fired core samples. Chevron commented that this level of Sor, though lower than that adopted by other operators in the basin, was consistent with its interpretation of Nisku waterflood potential when qualitatively compared with other carbonate reservoirs of varying quality. It acknowledged that if it had assumed the more widely used value of 35 per cent Sor, this would lower the waterflood recovery some 6 percentiles resulting in an estimate of 56 per cent.

Chevron agreed that core samples of vuggy carbonate do not readily lend themselves to laboratory testing. It indicated that in situ measurement of Sor using log-inject-log techniques was not sufficiently accurate to resolve widespread interpretative differences. Although it suggested that interface monitoring would permit a volumetrically calculated Sor, reliable evidence by this method would not be available for several years.

Using a mathematical simulation model, Chevron predicted a miscible flood recovery of 72.5 per cent for the Westpem Nisku A Pool. The simulation studies indicated that extensive solvent coning or fingering would lead to large costs for solvent reinjection and in the end would result in a large terminal oil leg in the lower frustrum of the reservoir. Chevron commented that close proximity of the two wells in the pool would induce solvent coning to a greater degree than might be expected on the wider well spacing more characteristic of other pools in the basin.

Chevron commented that relating the Nisku reef quality to a scale of 1 to 10, 1 being poor and characterized by the Rainbow reefs and 10 being good and characterized by the D-3 reefs, the Nisku reefs would be placed in a number 4 category. Chevron was of the opinion that current gas-oil ratio behaviour in Rainbow miscible flood schemes indicated current assigned recoveries of 70 to 80 per cent should be reduced 20 percentiles to the order of 50 to 60 per cent. By comparison, it expected that the Wizard Lake D-3A Pool would achieve an 84 per cent recovery. Chevron was of the opinion that from its grading of the Nisku reef quality and review of currently operating miscible flood schemes in Alberta, there would be a rather high technical risk in achieving predicted performance.

Sensitivity calculations performed by Chevron showed that a reduced level of dispersion could increase recovery by 2.5 percentile and, if the reservoir rock were completely homogeneous, the effect could be recovery improvement of 10 percentile above its adopted case.

Chevron indicated than an additional producing well might conceivably improve recovery by 7 to 10 percentile due to improved sweep efficiency but that no economic evaluation of additional drilling had been conducted.

Chevron suggested that net incremental recovery, accounting for energy losses through fuel consumption and residual gas, would more properly assess the overall conservation gains. Subsequent to the hearing, Chevron submitted the details of its energy balance calculations showing an oil equivalent energy loss of 2.4 percentiles. Chevron further acknowledged at the hearing that a slight, additional improvement in residual gas energy loss could be attained for a flood design injecting a methane push gas in lieu of a relatively rich solvent composition.

Chevron concluded that the aggregate incremental recovery of miscible flood over waterflood would be about 10 percentile which, after deductions for fuel and residual gas, would result in a net conservation gain of 7.5 percentile. Chevron acknowledged, however, that the gain could conceivably be as high as 20 percentile taking into account the possibility that waterflood recovery might be less than predicted while some factors might render the solvent flood more efficient than it had estimated.

Chevron stated that oil remaining after waterflooding still might be subject to some form of tertiary recovery. However, it testified that its experience in the SACROC CO_2 scheme located in Texas indicated there was considerable risk of failure of that kind of operation.

Views of the Board Staff

Applying an Sor of 35 per cent under waterflood and 5 per cent under miscible flood, the Board staff suggested a gross incremental conservation gain ranging from 15 to 25 percentile and an associated energy deficit of 4 to 5 percentile. This would result in a net conservation gain in the range of 10 to 21 percentile.

The Board staff in its technical assessment of miscible flood potential, provided a comparision of the reef geometry, and rock and fluid properties of the subject pool and those pools already approved or pending approval for miscible flood schemes in the West Pembina basin. It concluded by analogy that the A Pool was a superior candidate for miscible flooding. The comparison did not include the effects of interwell spacing, but the staff suggested that the Nisku pools, including the A Pool, were likely underdrilled and that subsequent infill wells would tend to alleviate coning problems.

The Board staff reported that preliminary estimates submitted by operators of other pools in the basin showed the incremental recovery gains would range from 29 to 35 per cent.

Views of the Board

The Board recognizes the inherent difficulties in assessing incremental recovery between miscible flood (MF) and waterflood (WF). Table 2 presents, for comparison purposes, the recovery estimates for both Chevron and the Board staff together with the Board's decision. A factor of major importance is the estimated Sor for each mechanism. The Board notes that both Chevron and the Board staff generally assumed an Sor of 0.05 for the miscible flood case. Moreover, it is evident that each one per cent increase in assigned waterflood Sor will result in nearly a one per cent increase in incremental recovery. The Board understands that the waterflood Sor employed by Chevron fell on the low side of the range determined from a large suite of samples in the basin. On the other hand, while the Board staff Sor value may be typical for many pools in the basin, the Board believes that the appropriate value for the A Pool may be somewhat lower owing to the pool's superior quality. The Board concludes that the Chevron waterflood forecast should be adjusted modestly downward by about 4 percentile in recognition of the probable waterflood Sor.

The Board believes that the diffusion coefficient used by Chevron implies a much higher level of instability and a much larger mixing region than should actually occur. In this respect the Board would attribute a further 3 percentile recovery benefit.

Respecting volumetric sweep efficiency, the Board believes it is reasonable to assume that another well would be drilled so that, by Chevron's evidence, this would provide a potential recovery improvement of around 8 percentile.

Combining all of the above adjustments, the Board finds that gross incremental recovery, MF minus WF, would be about 24 per cent. The Board notes that its findings are in the upper region of the Board staff's predictions of 15 to 25 per cent incremental recovery but not as high as predictions of 29 to 35 per cent gain submitted by other operators in the basin.

The Board therefore regards Chevron's estimated increment of 10 per cent as being unreasonably low which leads to an unacceptably negative outlook toward miscible flooding of the pool.

In a resource conservation sense the Board believes that the recovery ratios miscible/primary and miscible/waterflood, Table 2, should be born in mind. As well, the possibility of application of a follow-up tertiary process such as CO_2 injection should be factored into the selection of the enhanced recovery process. The recovery ratios deriving from Chevron's predictions, though perhaps down-playing the potential benefits of miscible flooding, nonetheless are significantly positive. The Board's view is decidely more positive, leading it to the conclusion that risk of economic failure would have to be considerable in order to justify application of the lower-grade waterflood recovery process.

The Board furthermore has considered the possibilities for future application of some follow-up tertiary process like CO_2 injection to this pool. The Board considers that the prospect for such application in any pool recovery process that, by the nature of the pool, is dominated by vertical displacement is indeed poor. In this respect, the recovery process chosen at this time to supplant primary depletion appears to be more than likely the one and only enhanced recovery choice. The decision as to the most appropriate choice therefore rests even more heavily on assessment of the prospect of economic loss against the prospect of conservation gain. Prudent conservation policy weighs rather heavily on the side of implementing a miscible flood in view of the fact that the investments in surface facilities, should the scheme fail at an early stage, would retain a very high salvage value. Moreover, there appears to be negligible possibility of physical loss of recoverable oil should it be found desirable to revert to a water injection program. The converse, unfortunately does not seem to apply. The conclusion again points very strongly in the direction of implementing a miscible flood unless total investment and potential loss of it looms very large in relation to the volume of oil recovery to be gained.

TABLE 2

CONSERVATION GAIN

	Primary	Waterflood	Miscible Flood	Gross Gain in Oil Recovery	Net Gain After Energy Deficits	Recovery Ratio	
						Miscible Primary	Miscible Water
Chevron	40	62.6 (Sor=27.3)	72.5 (range 72.5-83%)	Chevron 10% (range 10-20%)	7.5% (range 7.5-17.5%)	72.5/40	72.5/62.6
Board Staff	40	55 (Sor=35)	70-80	range 15-25%	range 10-21%	75/40	75/55
Board	40	58	82	24	20	82/40	82/58

4 ASSOCIATED ECONOMICS

Views of Chevron

Chevron explained that its corporate criteria for deciding whether an incremental investment is sound is based, firstly on whether the total profitability of the overall project is acceptable and secondly on whether the incremental profitability generated is as good as the average opportunity rate of return. Chevron employed opportunity rate of return of 20 per cent as a current guide.

Chevron acknowledged that the overall economics of the A Pool under miscible flooding would exceed 50 per cent rate of return and therefore would be more than acceptable. However, for the 10 percentile recovery gain it calculated an incremental rate of return of only 11.7 per cent, well short of its desired 20 per cent minimum target. Chevron contended that even if the incremental hydrocarbon recovery was 16 per cent under miscible flood, the incremental rate of return would be only 12.9 per cent. Also, it pointed out that with the recent location of a shallow low cost water source, the incremental rate of return would be even lower than shown in its initial calculations. Chevron believed therefore that its calculated incremental returns were inadequate for a prudent investor. Further, Chevron commented that there was no protection against slippage of profitability in the event of project failure.

Citing the current political uncertainties, it placed a high risk in applying economic parameters over the long term. Chevron stated that the calculated economics were based on hydrocarbon price schedules recommended by the Alberta Department of Energy and Natural Resources. This schedule assumed a two per cent real rate increase over general inflation rates.

Respecting changes in design that might improve the incremental economic return on the miscible flood, Chevron made the following observations:

- Substitution of multi-contact miscible fluid, though slightly leaner and of lower cost, would result in 2 to 3 per cent less recovery efficiency thereby nullifying the possibility of economic improvement.

- Because its model predictions indicate a high tendency for solvent coning, a large solvent bank would be necessary irrespective of the choice of first-contact or multi-contact miscible fluid.

- Reducing the solvent bank from 100 per cent down to possibly 65 per cent of hydrocarbon pore volume followed by a lean push-gas, would result in very little incremental economic improvement.

- Adjustment of its calculations to reflect payment of royalties on three-quarters rather than all of the blowdown gas to account for previous payment of royalties on purchased gas would only nominally improve incremental economics.

Chevron gave the opinion that the controlling economic constraint over miscible flood viability was the high cost of injection gas. With its assumptions of gas prices tracking the prices of the produced oil, the incremental gains generated by miscible flooding could not compete with relatively inexpensive waterflood operations. Chevron believed that only a large divergence in gas and oil prices would turn the economic outlook in favour of miscible flooding.

It was drawn to Chevron's attention that costs of purchased gas might not have been properly factored having regard for the existing large gas surplus and the trend for some gas to be sold at discount. In response, Chevron commented that it did not have any Chevron-owned shut-in gas in the immediate area, it was not aware of any available gas contracts at discounted prices and could not project the continuation of the current gas surplus beyond the early years of the miscible flood operation.

Chevron noted that, while its economic analysis was completed prior to changes suggested by the National Energy Program (NEP), its initial reaction was that the Petroleum and Natural Gas Tax would have the effect of reducing overall cash flows for both the waterflood and miscible flood by about one-third. However, it had not evaluated potential effects of the NEP proposed incentive price for tertiary oil production.

In further testimony Chevron stated that its interpretation of the provincial government's incentive programs was that benefits arising under section 4.2 of the Petroleum Royalty Regulations and the five-year royalty free holiday for discovery oil wells were not additive. Therefore, it was Chevron's view that section 4.2 oil incentives earned by the miscible flood in the royalty free period could not be carried forward and applied in later years.

Other possible actions which might improve the rate of return, such as tax deferments available to taxable corporations were not investigated. Chevron emphasized that only after a scheme had demonstrated its individual economic viability would it be blended with the corporation's financial portfolio. Chevron stated that it could not qualitatively assess either the risk or a comparison of investment opportunities between proceeding with miscible flooding the A Pool or investing the incremental funds in trying to discover a replacement barrel by exploration.

Views of the Board Staff

The Board staff, from a qualitative comparison study of the A Pool with other Nisku pools approved or pending approval for miscible flood schemes, could not identify any unique feature that would discount the A Pool's miscible flood economic viability.

The Board staff believed that reducing bank size and richness could increase incremental rate of return by about 1.5 per cent and that for each 5 percentile increase in recovery, the incremental rate of return would additionally be increased by about one per cent.

The Board staff was of the opinion that when there are substantial conservation gains to be achieved and when those gains can be attained with a project that yields attractive total scheme economics, the Board should require implementation of the scheme provided the incremental economic assessment gives an acceptable minimum rate of return.

Views of the Board

The Board considers the selection of an enhanced recovery process for the A Pool and other similar vertical displacement pools, to be of strategic importance in respect to economic conservation policy. In reaching a conclusion for the A Pool the Board believes it must have regard for a number of factors, some of which are only peripherally relevant to economics, including:

- The probability that application of water injection may preclude future tertiary recovery from a vertical displacement pool.
- The probability that a vertical solvent flood can be reverted to a bottom water flood with negligible influence on waterflood recovery.
- The likelihood that marginal improvement in miscible flood economics could be realized by reducing bank richness (+1 to 1½% IROR), reducing make-up gas costs by purchases discounted some 10 to 20 per cent, (+1 to 2% IROR), and gaining higher and longer stable production life through an additional well and more efficient recovery process (+2% IROR). These would be offset in a relative direction by lowered water supply costs (-1% IROR) and absence of of the additional well (-1% IROR). The net improvement over and above the 12-13% IROR calculated by Chevron would be some 2% or better.
- Conservation gain

  Gross MF minus Primary (RF:80-40) = $1.0 \times 10^6 m^3$
  Gross WF minus Primary (RF:60-40) = $0.5 \times 10^6 m^3$
  Incremental MF minus WF (RF:80-60) = $0.5 \times 10^6 m^3$

- Capital Investment

  MF - \$4.0 million
  WF - \$0.5 million

- Ratio of Capital Investment:Recovery Gain (\$/m^3)

MF:Primary	4 \$/m^3
WF:Primary	1 \$/m^3
MF:WF	7 \$/m^3

- Overall rate of return (OROR) and risk quality

MF:Primary	> 50% OROR	Medium Risk
WF:Primary	>> 50% OROR	Low Risk

The application of governmental policy incentives for tertiary recovery has a major effect on incremental rate of return (IROR) as between MF and WF.

a) If Section 4.2 not accredited and NEP tertiary incremental oil price not applied .... 9.5% IROR
b) If Section 4.2 applied but NEP tertiary price not accredited .... 11.0% IROR
c) If Section 4.2 not accredited but NEP tertiary price applied .... 10.0% IROR
d) If both Section 4.2 and NEP tertiary price applied .... 13.5% IROR

Further positive effects could be gained through design refinement, increased incremental oil recovery with an additional wellbore, use of discount injection gas, and inclusion of lower overall corporate tax rates. The Board concludes that with all or some of these mechanisms in place the minimum IROR would realistically be in the order of 15 per cent.

Nevertheless considering that the waterflood essentially precludes other forms of enhanced recovery, that the incremental capital investment to incremental recovery benefit for the solvent flood is quite low (7 \$/m^3), that a considerable part of the solvent flood capital investment may be salvaged and that the risk of failure of the process is only medium, the Board concludes that the right economic conservation choice is to implement a solvent miscible flood. The Board observes that rapid resolution of government treatment of incentives would much assist the accelerated development of this as well as other tertiary recovery programs.

5 DECISION

The Board denies Application No. 800163, a proposal to waterflood the Westpem Nisku A Pool. The Board will seek an order pursuant to section 37 of The Oil and Gas Conservation Act, subject to the approval of the Lieutenant Governor in Council, requiring Chevron to enhance oil recovery from the Westpem Nisku A Pool by implementation at the earliest practical date a suitably designed hydrocarbon miscible flood.

DATED at Calgary, Alberta, on 31 March 1981.

ENERGY RESOURCES CONSERVATION BOARD

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ENERGY RESOURCES CONSERVATION BOARD
Calgary, Alberta

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WABAMUN POWER PLANT ALTERNATIVE COOLING STUDIES

Decision 81-6
Application 800276

1 INTRODUCTION

1.1 The Application and Hearing

Board Approval No. HE 7606, issued to Calgary Power Ltd. respecting the operation of the Wabamun Power Plant located on the north shore of Lake Wabamun, contains a number of stipulations relative to matters of thermal discharge into the lake. In compliance with these stipulations, Calgary Power Ltd. submitted to the Board in April 1980 the following documents:

1. The Effect of the Thermal Discharges on the Aquatic Plants and Other Biota of Lake Wabamun;
2. The Wabamun Power Plant Cooling Alternatives; and
3. Environmental Overview of Alternative Cooling Facilities for the Wabamun Power Plant.

A public hearing to consider these submissions and interventions was held on 30 September 1980, and 13, 14, 15 and 16 January 1981, with V. Millard, C. J. Goodman, P.Eng., and E. E. Kupchanko, P.Eng., sitting.

Those who appeared at the hearing are listed in Table 1.

1.2 Background to the Application

Calgary Power is the owner and operator of the Wabamun power plant on the north shore of Lake Wabamun, some 65 km west of Edmonton. The plant has a nominal capacity of 590 megawatts (MW), consisting of one 70 MW gas-fired unit and three coal-fired units of 70 MW, 150 MW and 300 MW capacity, respectively. The first unit (70 MW) was installed in 1956 and the final unit (300 MW) in 1967. The power plant uses the lake to provide once-through cooling for the steam turbine condensers and other auxiliary coolers in the plant, thus discharging waste heat into the lake. Calgary Power is also the owner and operator of the Sundance power plant on the south shore of Lake Wabamun. That plant has a nominal capacity of 2 100 MW consisting of six coal-fired units with units 1 and 2 each rated at 300 MW and units 3, 4, 5, and 6 each at 375 MW. The commissioning dates for units 1, 2, 3, 4, 5, and 6 were 1970, 1973,

TABLE 1 PARTICIPANTS AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Calgary Power Ltd. (Calgary Power) D. O. Sabey, Q. C. R. M. Wilkinson	W. L. Fraser, P.Eng. Dr. J. B. Railton W. F. Purdy, M.L.A. all of Calgary Power Ltd.
	J. M. Crosby* D. K. Krochak both of Beak Consultants Limited
	Dr. T. C. Griffing of International Environmental Consultants Ltd.
	J. Robinson, P.Eng. of Montreal Engineering Company Limited
Summer Villages of Point Alison and Kapasiwin and Village Residents M. J. Trussler	Dr. R. W. Davies L. R. Linton F. J. Wrona all of University of Calgary
	J. H. Forest (also on behalf of Paul Hartman, Mayor of Point Alison)
	R. B. Nimmons (Also on behalf of L. G. Thomas, Dr. J.E.S. Henderson, and M. Pelletier).
	Dr. R. S. Henderson
	Mr. Justice S. B. Smith
	Dr. S. H. Simmonds
Village of Wabamun F. G. Lindsay	F. G. Lindsay C. E. Sandberg
Lake Wabamun Preservation Association J. A. Bryan	R. G. Hurlburt Mrs. L. Hardy
Dr. P. R. Gorham	Dr. P. R. Gorham Dr. E.A.D. Allen
Energy Resources Conservation Board Staff M. J. Bruni, Board Solicitor K. Miller, Board Solicitor J.N.G. Yu, P.Eng. S. S. Lota, P.Eng.	
Department of the Environment Staff P. G. Shewchuk, P.Eng.	

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* Miss J. M. Crosby formerly with Beak Consultants, is presently with Alberta Environment.

1976, 1977, 1978, and 1980 respectively. Units 1 and 2 did initially discharge waste heat into Lake Wabamun but ceased the practice in December 1975. Since then, the Sundance plant has used cooling facilities completely independent of Lake Wabamun.

Lake Wabamun is a typical prairie lake where aquatic macrophytes occur naturally in shallow bays in response to nutrient-rich substrates, warm temperatures and long summer days. Although the growth of these plants is essential to provide food for fish and other lake inhabitants, these plants can also present a nuisance to recreational users of the lake, interfering with fishing lines, swimmers and boating activities.

The Wabamun Lake weed nuisance was severely accentuated in the early 1970's by a prolific growth of Elodea canadensis at the lake's northeastern end near the Wabamun power plant thermal discharge outlet. However, Elodea is not a common plant in lakes north of Edmonton. The nuisance feature of this plant lies in its ability to form large rafts on the water surface which eventually wash ashore causing concern among local residents and cottage owners. They made submissions to the Board in 1972 at a public hearing respecting the addition of units No. 3 and 4 at the Sundance power plant. They argued that the discharge of heated water from both Wabamun and Sundance plants had caused rapid growth and spread of Elodea resulting in the severe deterioration of recreational value of the lake and that therefore Calgary Power should be required to find alternative means of rejecting waste heat. The Board recognized the recreational value of Lake Wabamun and ordered (Approval No. HE 7307) Calgary Power to undertake studies on the effects of thermal discharge from the Wabamun power plant on the growth and spread of weeds in the lake and to consider alternative cooling facilities to reduce or completely eliminate thermal discharge to the lake. In 1976 after a public hearing, the Board granted Calgary Power an extension of time for the above and additional studies (Approval No. HE 7606). The current application and hearing is a culmination of the foregoing events.

2 DEFINITION OF THE ISSUES

The Board considers the issues of this application to be:

1. The effects of thermal discharge on weed growth;
2. The alternative independent cooling facilities;
3. The impact of alternative cooling facilities and comparison with the impact of existing facilities; and
4. The weed harvesting program.

3 THE EFFECTS OF THERMAL DISCHARGE ON WEED GROWTH

3.1 Calgary Power's Views

In 1973, the Board directed Calgary Power to conduct studies to determine whether the discharge of thermal effluent from the Wabamun power plant into Lake Wabamun was a significant factor contributing to the growth or spread of weeds in the lake. To comply with this directive, Calgary Power retained Beak Consultants to undertake such a study. Beak started the study in 1973 and completed it in 1978. During the study period, a unique opportunity arose which allowed Beak to study the effect of the cessation of thermal discharge on the aquatic weed growth as the Sundance power plant was to discontinue discharging into Lake Wabamun by December 1975.

Beak stated that it was evident from the outset that one particular species of weed called Elodea canadensis was growing abundantly and causing most of the nuisance in the lake. Thus, Elodea became the focus of the study and other aquatic plants and biota were studied in less detail.

Beak stated that the thermal discharge resulting in lack of ice-cover in the outlet area allows Elodea to over-winter as non-dormant shoots. By spring, growth is well established making it very difficult for dormant native species to compete for light, space and nutrients. Rafts of Elodea could be produced in the outlet areas by early summer, giving it the advantage of long summer days to recolonize in new areas. Elodea rafts were very rarely produced in ice-covered areas and were not produced until September, making recolonization and survival improbable in the coming winter.

Beak further stated that, observing Elodea for a number of years, a distinct and unique growth pattern became obvious. An area known to be previously bare of Elodea would be colonized. The plants in the colonized area would increase to high levels of density and vigour. This level would be maintained for one to five years, then the population would suddenly "crash", disappearing in a matter of weeks leaving no trace or only a few scattered survivors. This pattern of "boom and bust" could be traced time and again in Lake Wabamun. Indeed, major populations of Elodea have now crashed permanently and the only major colony remaining is to be found in the Wabamun power plant cooling water outlet area. The decline is evident from the drastic reduction of the amount of weeds harvested in recent years, from a total of over 5 000 tonnes in 1973 to under 300 tonnes in 1980.

Beak observed that after the thermal discharge of the Sundance plant was removed from the lake in December 1975, the population of Elodea near the Sundance outlet continued to thrive in 1976. In the spring of 1977, it crashed and virtually disappeared with only small patches remaining near the old outlet (0.1 per cent of the previous fall's crop). The Sundance crash could not be explained by the removal of heat or light from the area since the effect would have been more immediate, and all plants would have responded similarly, and no survivors would have remained. Also, the post-cessation temperature regimes were well within the tolerance limits for *Elodea* and were similar to ice-covered areas which continued to support *Elodea*. Neither could the crash be explained by successful competition from other species, since in 1976 the area was a virtual monoculture of *Elodea*; following the crash, the area remained bare for almost a year.

The boom and bust phenomenon of *Elodea* has been observed in numerous other countries in the past. However, the cause of the sudden waning of super-abundant *Elodea* populations has remained unknown. The literature suggests that, once gone, *Elodea* does not reappear. Circumstantial evidence suggests that *Elodea* crashes could be caused by depletion of a critical sediment nutrient. Literature reviews revealed that Sculthrope (1967) concluded ". . . it is therefore conceivable that iron was, and is, the critical micronutrient for *Elodea* . . .". Hence, Beak proceeded to do a sediment nutrient survey and analysis and found that, amongst other things, there was a statistical correlation between the concentration of total iron in the root zone of lake sediment and the abundant growth of *Elodea*. Beak, therefore, suggested that this "iron hypothesis" is the best explanation for the decline of *Elodea* in Lake Wabamun.

The study also covered impacts of thermal discharges on lake level, evaporation and salt concentration, algae, invertebrates, fish and waterfowl. Beak concluded there is either no, or only minor, localized adverse impact with respect to these.

Beak concluded that thermal discharge has directly or indirectly contributed to some changes in aquatic plant growth in the lake in the past, but that the cessation of heat would have an insignificant impact on the total biomass and proliferation of nuisance weeds (ie. *potamogeton*, *myriophyllum*) in the lake. From 1970 until 1974 the enjoyment of recreational activities was severely but briefly restricted by dense *Elodea* in Kapasiwin Bay and near the Sundance plant. Since then, the *Elodea* has disappeared in all but a few small areas of Lake Wabamun. Beak concluded that *Elodea* is not likely to spread again through the lake because:

(a) harvesting by present Calgary Power equipment could intercept rafts before they spread;

(b) only 10 per cent of the lake is of suitable depth, sheltered from turbulence and of substrate texture suitable for *Elodea*; and

(c) most of the areas discussed in (b) above experienced an Elodea boom, the sediment is now depleted of iron so *Elodea* will not likely return for many years.

3.2 The Interveners' Views

Appearing as an expert witness on behalf of the villages of Kapasiwin and Point Alison and area residents, Dr. Davies agreed with Beak that there is a relationship between thermal discharge and Elodea abundance. He found that the explanation given by Beak for Elodea's initial vigorous growth was understandable and reasonable.

Dr. Davies stated that the sampling technique used by Beak for the concentration of iron in the lake sediment was questionable and that the Beak's iron hypothesis to account for the Elodea crash was based on inappropriate analysis. He said that the analysis should be done based on multi-variate factors rather than one factor at a time as the growth and spread of Elodea are affected by a number of factors.

Dr. Davies suggested that the decline of Elodea and the recolonization of other species of aquatic macrophytes is most probably related, directly or indirectly, to the cessation of the thermal discharge and that cessation of thermal discharge at Wabamun plant would result in a decline or elimination of Elodea with an increase in the other species.

Intervening at the hearing as interested parties for the purpose of providing their knowledge and expertise on Lake Wabamun weed problems, Dr. Gorham and Dr. Allen also agreed with Beak that the growth and abundance of Elodea in the lake was due to competitive advantage provided to it over other species by thermal discharge and lack of ice cover. However, they questioned the validity of Beak's iron hypothesis to account for the disappearance or crash of Elodea in the lake.

Dr. Allen, whose experience with Lake Wabamun dates back to the late sixties, said that the Beak's iron hypothesis fails for the following two main reasons:

(1) Total iron present in the lake sediments is high and virtually all in the ferrous form. The extraction method used would selectively remove the most soluble forms of iron but less soluble forms could also be available to the plants.

(2) Elodea and other species do not appear to have unusually high iron demands and it would take much longer than 5 years to deplete the iron by the amount suggested by Beak.

Dr. Gorham stated that Elodea is at the northern limit of its range in Lake Wabamun. At this latitude where lakes are normally covered with ice from October to April, it behaves largely, if not entirely, as annuals. It dies during the late fall and winter and has to re-establish in the spring, most commonly by dormant buds called turions. In heated, continuously ice-free areas, however, Elodea ceases to exhibit dormancy and continues winter growth. Myriophyllum and other native species do not behave in this manner. This gives Elodea a distinct competitive advantage. The annual mechanical harvesting that has been going on in Kapasiwin Bay since 1972 has concentrated on the areas of greatest macrophyte abundance and cover during the period of maturation and standing crop. Mechanical cutting of both stem and turions at this stage must interfere significantly with the degree of regenerative success and, therefore, of abundance. Dr. Gorham suggests that the cumulative effect of mechanical harvesting is probably one of the important factors involved in the decreased abundance of Elodea and other macrophytes.

3.3 The Board's Views

Beak's study indicated that the thermal discharge would have either no or minor localized adverse effects on the lake level, evaporation and salt concentration, algae, invertebrates, fish and waterfowl. These conclusions were not seriously challenged and the Board accepts them.

The Board notes that although quantities of other types of weeds are present in the lake, general agreement exists among all parties that Elodea is the main weed problem in Lake Wabamun and that its establishment in the lake was materially aided by thermal discharge into the lake. The Board accepts this finding.

An understanding of the phenomenon of population explosion and decline exhibited by Elodea would be of great value in making a final decision regarding the appropriate corrective measures to be taken. The iron hypothesis advanced by Beak appears to be a possible explanation but the Board finds the evidence to be inconclusive. There is, however, clear evidence respecting the drastic reduction of the amount of weeds harvested in recent years. Whatever the underlying reason, the Board believes that the Elodea nuisance is now controlled to an acceptable degree and that the mechanical harvesting program provides a means of maintaining control.

4 THE ALTERNATIVE INDEPENDENT COOLING FACILITIES

4.1 Calgary Power's Views

Calgary Power commissioned Montreal Engineering Company, Limited (MECO) to evaluate cooling facilities for the Wabamun power plant as alternatives to the current practice. The methods considered were:

- cooling pond in the Whitewood mine area
- natural draft cooling towers
- mechanical draft cooling towers
- extension of discharge canal into the lake
- cooling water discharge tempering

The cooling pond alternative was eliminated because of the high cost of rehandling 46 000 000 cubic metres of unsuitable overburden material. Natural draft cooling towers were eliminated in a comparison of its overall costs with those of mechanical draft towers.

Both the open and the closed systems of mechanical draft cooling tower alternatives were examined. An open system would depend on Lake Wabamun for make-up water and would reduce by about two-thirds the amount of heat rejected into the lake. A closed system would reduce the heat into the lake to almost zero. The source of make-up water for the closed system would either be from Lake Wabamun all year long or from the North Saskatchewan River for eight months of the year and four months from the lake.

An extension to the discharge canal would differ from the present system only in that the point of release of the discharge would be extended through a metal conduit 730 metres further into the lake and would be released 4.5 metres below the lake surface.

Tempering of the discharge water would leave the existing system intact but would extend the provision of facilities for mixing the cooling water discharge with cooler lake water after exit from the power plant and prior to entry into the lake. This method would not alter the quantities of heat entering the lake but would reduce the temperature differential between discharge water and lake water.

All the alternative facilities mentioned above would be located somewhere on the parcel of land south of the power plant, north of Point Alison and between the existing inlet and outlet canals.

MEOO prepared cost estimates for the alternative cooling facilities examined as shown in Table 2.

In addition, there would be an added $ 50 000 per year penalty due to loss of plant efficiency if a closed cooling tower alternative were selected.

Calgary Power stated that it has no plans to decommission any units at the Wabamun power plant before 1995. Although the plant has operated at lower capacity in recent years, factors such as the future energy requirements of the Alberta interconnected system, cost of energy from the Wabamun power plant compared to cost of energy from other plants in Alberta, and transmission costs will dictate the level of operation of the power plant and the decommissioning dates. Calgary Power stated that such factors cannot be accurately determined at this time. Therefore, it is not possible to be exact regarding the future operation of the plant. Calgary Power stated that it would be undesirable to place a restriction on plant operation to control weed growth.

In response to the interveners' recommendation of the use of natural draft cooling towers or the use of air cooled condensers located between the power plant and Highway 16, Calgary Power stated that these systems would require enormous amounts of space to install, would be rather large in size and extremely costly, and would require substantial modifications to power plant equipment.

As noted in Section 4.2, one intervener suggested reversing the direction of the existing cooling water system. Calgary Power responded that this is not just a matter of reversing the pumps. This system would require two canals crossing each other and a new pumphouse, all located in the upper part of Point Alison, and would cost some 18 to 20 million dollars.

TABLE 2 COST ESTIMATES OF ALTERNATIVES
In 1979 Dollars

Alternatives	Capital Cost* ($ millions)	Annual Operating and Maintenance Cost ($ thousands)	Impact on Cost of Electric Energy Production at Wabamun, mills/kWh
Extension of Discharge Canal	$ 7.3	115	0.3
Cooling Water Discharge Tempering	8.7	264	0.4
Cooling Towers, Open System	19.8	1 129	1.2
Cooling Towers, Closed System Lake Wabamun Makeup	22.0	1 314	1.4
Cooling Towers, Closed System Lake Wabamun & North Sask. River Makeup	38.6	1 473	2.1

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* Including interest during construction.

4.2 The Interveners' Views

Interveners suggested the use of natural draft cooling towers or air cooled condensers located between the power plant and Highway 16 to provide cooling for the plant independent of Lake Wabamun. They did not give any details for these suggested alternatives.

One intervener suggested reversal of the direction of the existing once-through cooling system. He stated that this procedure would discharge the heated water into a deeper and less sheltered bay now being used for the inlet canal. While this would not reduce the heat load on the lake, it may have benefical effects on weed growth. If this reversal of flow is further coupled with the extension of a discharge line, the heated water could be discharged into deeper water which is more exposed to winds thus permitting greater dissipation of heat before approaching shoreline locations.

4.3 The Board's Views

The Board is of the view that system reliability requires existing power plants to be capable of maximum output when required and agrees with Calgary Power that it would be undesirable to place a restriction on the level of operation of the Wabamun power plant as a means to control nuisance weed growth in the northeastern end of the lake.

The Board agrees that a cooling pond or air cooled condenser located north of the power plant and south of Highway 16 would be inappropriate because of the high cost involved in the construction and operation and other shortcomings.

The Board notes that only the closed system cooling tower alternative would result in almost zero heat discharge into the lake. The open system cooling towers would reduce the heat input while the extension of discharge canal, cooling water discharge tempering and the reversal of flow suggested by an intervener would not reduce any heat rejected into the lake. These latter methods would just alter the thermal effect in the existing discharge area.

The Board also notes that the capital, annual operating and maintenance costs for each alternative are relatively high and directly proportional to the effectiveness with which the particular alternative could reduce the amount of heat rejected into the lake.

5 THE IMPACT OF ALTERNATIVE COOLING FACILITIES AND COMPARISON WITH THE IMPACT OF EXISTING FACILITIES

5.1 Calgary Power's View

Calgary Power commissioned International Environmental Consultants (IEC) to conduct studies to assess the impact of alternative cooling facilities.

IEC stated that cooling tower alternatives would generate fog which could become a traffic hazard on nearby Highway 16. Noise from the towers would have significant negative impacts on residents of nearby cottages. Two cottages at the base of Point Alison would be so close to the towers that drift and noise would probably make them unusable.

However, cooling tower alternatives would have a beneficial impact on local employment during construction and moderately positive impact on the local economy. The construction of any of the alternative facilities would likely have an adverse impact on the growth of local property values, particularly in the Point Alison area.

Also, the construction of any alternative would introduce silt or sediment in the foreshore area which would serve to accentuate weed problems by the possible introduction of nutrients and creating favourable lake bottom sediments for weed growth. IEC stated that none of the alternative cooling facilities examined would resolve the problem of nuisance aquatic macrophytes in the lake.

IEC concluded that an expanded weed harvesting program with no change in the existing cooling system is the only alternative which has significant beneficial impacts and has only minor negative impacts. Also, expanded weed harvesting involves comparatively minor capital and operating costs and therefore would have the least economic impact on Calgary Power's customers.

5.2 The Interveners' Views

Some residents of the village of Point Alison stated that they would be directly and adversely affected by implementation of any of the alternative cooling facilities, particularly the cooling towers.

The Village of Wabamun submitted that installation of cooling towers would be unacceptable because the noise and fog would be detrimental to any future recreational development along the lake shoreline. Also, a cooling pond located in the Whitewood mine area could create a safety hazard to the village as the village is at a lower elevation than the mined-out area.

Most area residents and cottage owners, although attributing the growth of nuisance aquatic macrophytes to the thermal discharge from the Wabamun power plant, were opposed to the construction of any of the alternatives studied by Calgary Power. They felt that Calgary Power's existing operation is unsatisfactory but the alternative cooling facilities are even less satisfactory. They would favor the status quo with an improved weed harvesting program.

Dr. Gorham stated that the most predictable and economical control to prevent nuisance levels of macrophyte growth from occurring in Kapasiwin Bay would be continued careful and consistent mechanical harvesting rather than discharge cessation or alternative cooling.

5.3 The Board's Views

The Board concurs that the construction and operation of any of the alternative facilities studied would have a significant adverse impact on the area residents and cottagers, particularly those of Point Alison.

The Board notes that both the applicant and most interveners oppose the construction of any cooling alternatives and favour the status quo with an improved weed harvesting program carried out by Calgary Power.

In view of some uncertainty respecting the effectiveness of alternative cooling facilities, the high capital and operating cost for those facilities, the significant adverse impact of those facilities to area residents and cottage owners, the Board agrees that alternative cooling facilities are not warranted.

6 THE WEED HARVESTING PROGRAM

6.1 Calgary Power's Views

As directed by the Board, since 1972, Calgary Power has carried out a weed harvesting program each summer in that area of the lake subject to the thermal dishcarge from the Wabamun power plant. Up to three mechanical harvesters have been used. These harvesters cannot operate in water shallower than 0.6 metre or harvest to a depth greater than 1.5 metres. Harvesting commences around May 15 or when the weeds reach the surface and continues until the end of August. The harvesting program has been designed and carried out by its staff without input from residents and cottagers adjacent to the plant. A summary of Calgary Power's weed harvesting program to date is shown in Table 3. Since 1974, Calgary Power has installed a 600 metre long floating boom to stop rafts of weeds reaching Kapasiwin Beach. However, this boom interferes with boating activities. Calgary Power said that representatives of the Village of Kapasiwin will be asked each year to decide whether or not the weed boom should be placed in the lake.

Calgary Power stated that it will carry out an expanded harvesting program as shown in Figure 1. Calgary Power proposed that consideration be given by the community adjacent to the Wabamun Plant, and perhaps by representatives of the provincial government, to the establishment of a joint committee to direct the weed harvesting program. Depending on the extent of the program, some financial contribution from the other participants might be necessary.

6.2 The Interveners' Views

On behalf of her clients, Ms. Trussler said that the present harvesting program is not held in high regard by the residents. She said Calgary Power knows this matter is of great concern to the cottagers and yet

TABLE 3 SUMMARY OF CALGARY POWER WEED HARVESTING PROGRAM*

	1972	1973	1974	1975	1976	1977	1978	1979	1980
1. Grid Area (Hectares)	93	128	128	128	128	128	128	128	128
2. Area actually harvested (Hectares)	84	114	75	56	30	65	84	58	37
3. Weeds harvested in grid (tonnes)	1 402	3 264	1 148	302	235	348	610	362	245
4. Beach clean-up (tonnes)	140	1 204	911	-	-	-	-	-	-
5. Other clean-up (tonnes)	-	191	5	14	-	-	19	10	11
6. Total Removed (tonnes)	1 543	4 660	2 064	316	235	348	629	372	256
7. Weed Harvested Cost ($ thousands)	90	97	72	77	52	49	53	57	54

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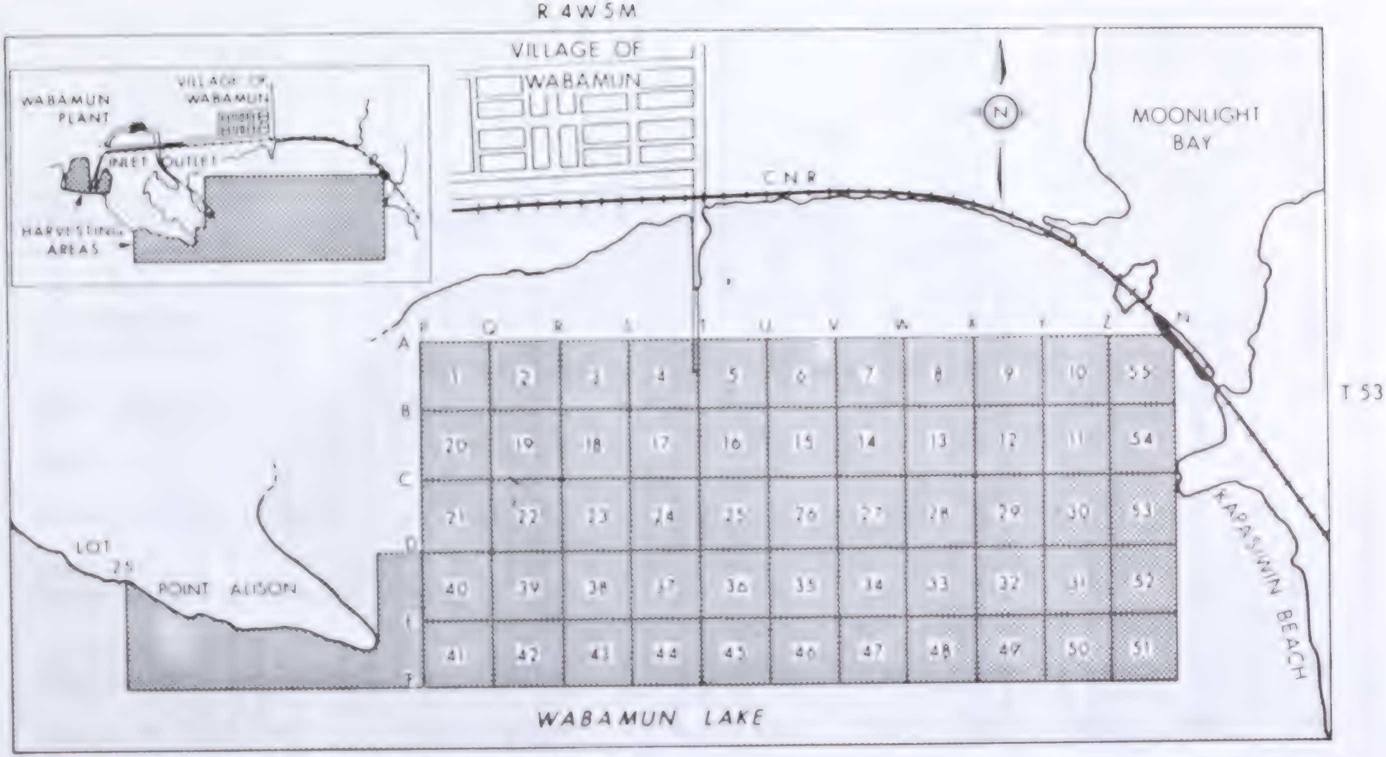
* Adopted from Calgary Power, Lake Wabamun Aquatic Weed Control Program 1980.



ADOPTED FROM CALGARY POWER LTD APPLICATION NO 800276

FIGURE 1 EXPANDED WEED HARVESTING AREAS - WABAMUN PLANT

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA CANADA

admits that it had never contacted or discussed the harvesting program with them.

She said that her clients would be satisfied with an upgraded and supervised harvesting program covering the whole of Point Alison and the Kapasiwin Bay area, including the shallow areas. Furthermore, area residents should be consulted on the design and implementation of the harvesting program. Ms. Trussler said that there should be a provision made for the residents to come back to the Board if the harvesting program proved to be inadequate. She also stated that the position taken by the Lake Wabamun Preservation Association regarding a delay in the Board decision respecting this application is totally unacceptable to her clients.

The Lake Wabamun Preservation Association stated that the Board should require the establishment of a Lake Wabamun Weed Control Authority to oversee and control the weed cutting, harvesting and disposal of weeds in Lake Wabamun. It suggested that the Board recommend that the Provincial Government strengthen the terms of reference of the Lake Wabamun Watershed Advisory Committee. It acknowedged that this is not within the jurisdiction of the Board. However, a recognition of that committee and its efforts towards correlating and reviewing the 70 odd studies that have already been done on the lake and implementing additional studies going beyond the Beak Report, would be extremely helpful. It suggested that the Board defer its decision on the subject matter until a more comprehensive study has been completed.

6.3 The Board's Views

Judging by the large reduction of weeds harvested in recent years relative to those in 1972 - 1974, the Board believes that mechanical harvesting has been reasonably successful in alleviating interference with recreational uses of the lake. However, the Board notes that Calgary Power made little effort to consult with the residents and cottagers of Kapasiwin and Point Alison in the design and implementation of its weed harvesting program.

The Board believes it is reasonable to require Calgary Power to harvest weeds in that part of the lake subject to and in the areas of the thermal discharge from the Wabamun plant but not reasonable to require Calgary Power to harvest weeds in every part of the lake. Therefore, the Board believes it is not appropriate as a result of these studies to establish a Lake Wabamun Weed Control Authority to oversee the weed harvesting program for the entire lake. It is reasonable to expect Calgary Power to consult with area residents and allow those persons carrying out the weed harvesting to use discretion in harvesting outside the established grid.

As acknowledged by the Lake Wabamun Preservation Association, the matter of the terms of reference for the Lake Wabamun Watershed Advisory Committee established by the Minister of the Environment is beyond the jurisdiction of the Board.

The Board is prepared to review the thermal discharge matter again if the expanded harvesting program proves to be inadequate or new evidence warrants such a review.

7 FINDINGS AND DECISION

The Board, having publicly heard the submissions and having studied the evidence by Calgary Power and the interveners, finds as follows:

(a) Independent alternative cooling facilities need not be installed at the Wabamun power plant;

(b) Calgary Power shall undertake a harvesting program in an area as shown shaded in Figure 1; and

(c) Calgary Power shall obtain input from cottagers and residents at Kapasiwin and Point Alison for consideration in implementing an expanded weed harvesting program.

Having regard for its findings and responsibilities under The Hydro and Electric Energy Act, the Board is prepared, subject to the approval of the Minister of the Environment with respect to environmental matters, and with the authorization of the Lieutenant Governor in Council, to allow the continued operation of the Wabamun Power Plant using Lake Wabamun for once-through cooling and to order Calgary Power to carry out an expanded weed harvesting program in an area as shown in Figure 1.

The Board Approval No. HE 7606 will be amended accordingly and would be in the form set out in Appendix A and subject to the terms and conditions therein contained.

DATED at Calgary, in the Province of Alberta, this 28 day of April, 1981.

V. Millard
Chairman

C. J. Goodman

C. J. Goodman, P.Eng.
Board Member

E. Kupchanko

E. E. Kupchanko, P.Eng.
Acting Board Member

APPENDIX A FORM OF APPROVAL

THE PROVINCE OF ALBERTA

THE HYDRO AND ELECTRIC ENERGY ACT

ENERGY RESOURCES CONSERVATION BOARD

IN THE MATTER of a power plant of
Calgary Power Ltd. on the north
shore of Lake Wabamun

APPROVAL NO. HE________

WHEREAS the Energy Resources Conservation Board, with the authorization of the Lieutenant Governor in Council, has approved the construction and operation by Calgary Power Ltd. of the Wabamun power plant; and

WHEREAS Calgary Power Ltd. has applied to the Energy Resources Conservation Board for certain amendments to the said approval; and

WHEREAS the Energy Resources Conservation Board is prepared to grant the application, subject to the terms and conditions herein contained, and the Minister of the Environment has given his approval of the application, insofar as it affects matters of the environment; and

WHEREAS the Energy Resources Conservation Board considers it desirable that the approval for the Wabamun power plant be revised and consolidated and a new approval issued.

THEREFORE, the Energy Resources Conservation Board, pursuant to The Hydro and Electric Energy Act, being chapter 49 of the Statutes of Alberta, 1971, and the Lieutenant Governor in Council having given his authorization by Order in Council, dated________________, 1981, and numbered O.C.____________, hereby orders as follows:

1. The construction and operation by Calgary Power Ltd. (hereinafter called "the Operator") of a power plant of 582 megawatts total nominal capacity located on the north shore of Lake Wabamun in

the south-west quarter of Section 11, Township 53, Range 4, West of the 5th Meridian, is approved.

2. Subject to the other provisions of this approval, the power plant shall be in accordance with

(a) a letter dated March 10, 1960 from the Alberta Power Commission to the Operator approving the installation of a 150 MW unit in the Wabamun plant,

(b) a letter dated August 14, 1964 from the Alberta Power Commission to the Operator approving the installation of a 300 MW unit in the Wabamun plant,

(c) The Final Air Pollution Approval No. 1042-P-519 dated May 1, 1969, issued by the Provincial Board of Health to the Operator,

(d) a letter dated February 10, 1971 from the Provincial Board of Health to the Operator requiring the installation of dust collecting equipment by May 1, 1973,

(e) the application to the Energy Resources Conservation Board, from the Operator dated August 13, 1975, and

(f) the application to the Energy Resources Conservation Board, from the Operator dated April 22, 1980.

3. The Operator shall operate the electrostatic precipitators for units 2, 3, and 4 so that the concentration of particulates in the effluent gases to the atmosphere from each of the power plant stacks shall not exceed the emission standards established under The Clean Air Act.

4. Until otherwise directed by the Board, the Operator shall, during each summer season,

(a) cut and remove aquatic weeds from the east end of Lake Wabamun in an area as shown in Appendix I to the satisfaction of the Board,

(b) undertake any other such action deemed necessary by the Board to mitigate the effects of aquatic weed growth on the recreational use of the east end of Lake Wabamun, and

(c) submit to the Board, by December 31 of each year, or such other date as may be stipulated by the Board, a report outlining the details of the weed harvesting program for the year. The report shall include the amounts of weeds harvested, the type of weeds harvested and the relative proportions, the total area harvested, any beach clean-ups, the cost of weed harvesting, and record any unusual observations.

5. The Operator shall, prior to and throughout each year's weed growing season, consult with the lake cottagers and area residents at Kapasiwin and Point Alison with respect to weed harvesting and shall attempt to respond to reasonable requests.

6. The Operator shall monitor and report on the discharge rates and ambient concentrations of the gaseous, liquid and solid effluents from the Wabamun power plant, and associated facilities, to the satisfaction of the Department of the Environment and particularly in accordance with licences issued under The Clean Air Act and The Clean Water Act and to the satisfaction of the Board as it may, from time to time, specify.

7.(1) Insofar as they pertain to matters of the environment, the applications of the Operator are subject to the approval of the Minister of the Environment.

(2) The approval of the Minister of the Environment, in accordance with subclause (1), is attached hereto as Appendix II and this approval is subject to the terms and conditions therein contained.

8. The Board may at any time

(a) upon its own motion, or

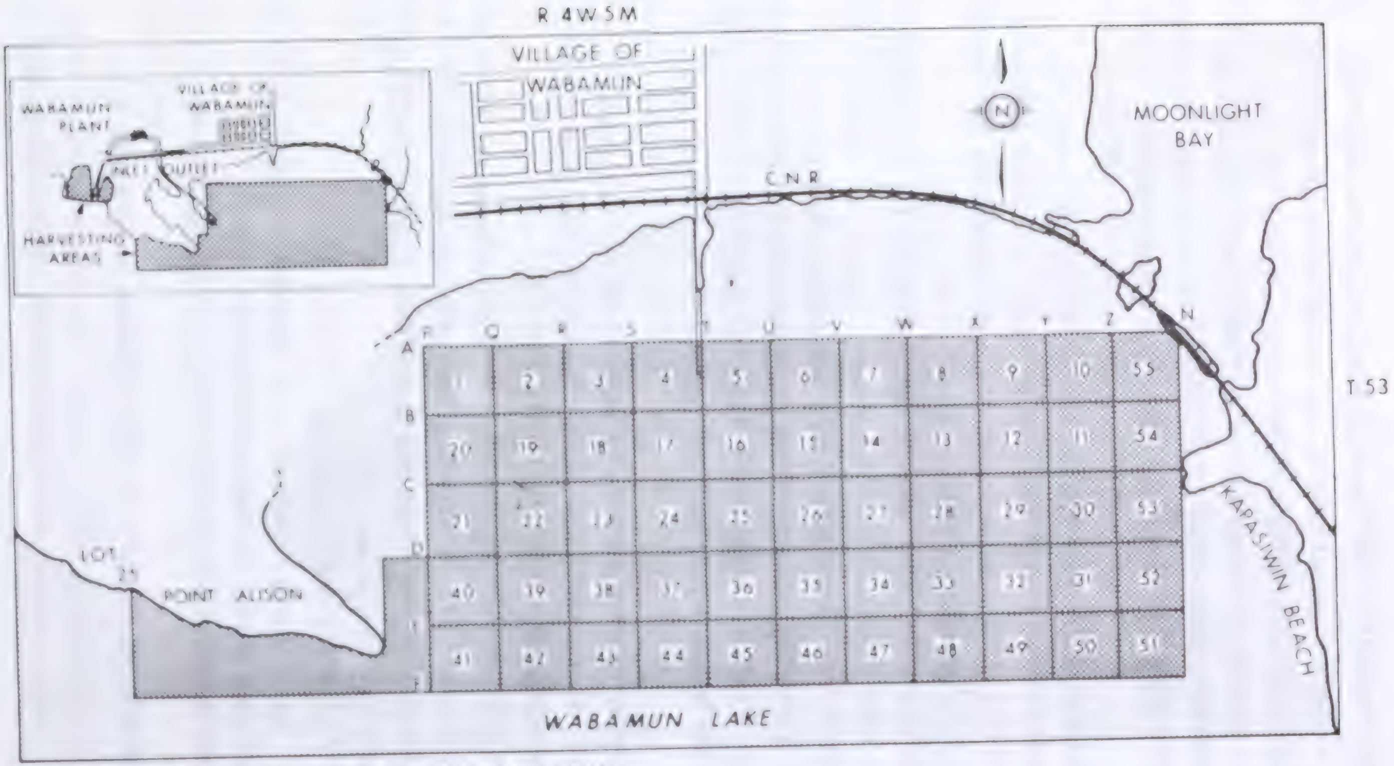
(b) upon the application of an interested person, vary the terms and conditions hereof or rescind this approval.

9. Board Approval No. HE 7606 is hereby rescinded.

MADE at the City of Calgary, in the Province of Alberta, this ________day of________________, 1981.

ENERGY RESOURCES CONSERVATION BOARD

V. Millard
Chairman



ADOPTED FROM CALGARY POWER LTD APPLICATION NO 800276

APPENDIX I TO APPROVAL NO. HE ___

EXPANDED WEED HARVESTING AREAS - WABAMUN PLANT

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA CANADA

DOC
Admin
E56
Alta.
Bb

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

APPLICATIONS FOR PERMITS
TO CONSTRUCT PIPELINES AND
RELATED FACILITIES BETWEEN
LLOYDMINSTER AND COLD LAKE
AND BETWEEN EDMONTON AND COLD LAKE

DECISION 81-7
APPLICATIONS 800561,
800562, 800741, 800742,
800806, 800807, and 800897

1 INTRODUCTION

The Board received six applications, pursuant to The Pipeline Act, 1975, for permits to construct pipelines and related facilities to transport crude oil from the Cold Lake area. It also received an application pursuant to The Oil and Gas Conservation Act for approval to construct a truck pit and blending plant at Cold Lake. Three of the applications were filed by Algas Engineering Services Ltd., on behalf of Husky Oil Operations Ltd. (Husky), for approval to construct pipelines and related facilities to transport heavy crude oil from Cold Lake to the Husky refinery at Lloydminster. Four applications were received from Alberta Energy Company Ltd. (AEC), for the construction of pipelines and related facilities to transport heavy crude oil from Cold Lake to the Esso-Strathcona refinery at Edmonton.

Following the filing of the original submissions, AEC applied to defer the routing considerations of its pipeline permit applications for approximately the most westerly 16 kilometres (km) of the route. The Board approved the request and deferred consideration accordingly. The routes of the pipelines in the applications by Husky and AEC and the portion for which consideration was deferred are shown on Figure 1.

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2 THE APPLICATIONS

2.1 Applications by Husky

Husky applied for a permit to build a crude oil (bitumen) blend pipeline (Application 800561) between the Cold Lake area and its Lloydminster refinery. The pipeline design is based on transporting a crude bitumen-condensate blend at a maximum rate of 4850 cubic metres per day (m^3/d). The blend would consist of approximately 30 per cent condensate and 70 per cent crude bitumen. The condensate would be transported to Cold Lake via a pipeline from Lloydminster. Application 800562 is for a permit to build the condensate pipeline with a design capacity of 1455 m^3/d. The crude bitumen blend line is proposed to be a 323.9 millimetre (mm) outside diameter (O.D.) line while the condensate line is proposed to be 168.3 mm O.D. The length of each pipeline is approximately 145 km.

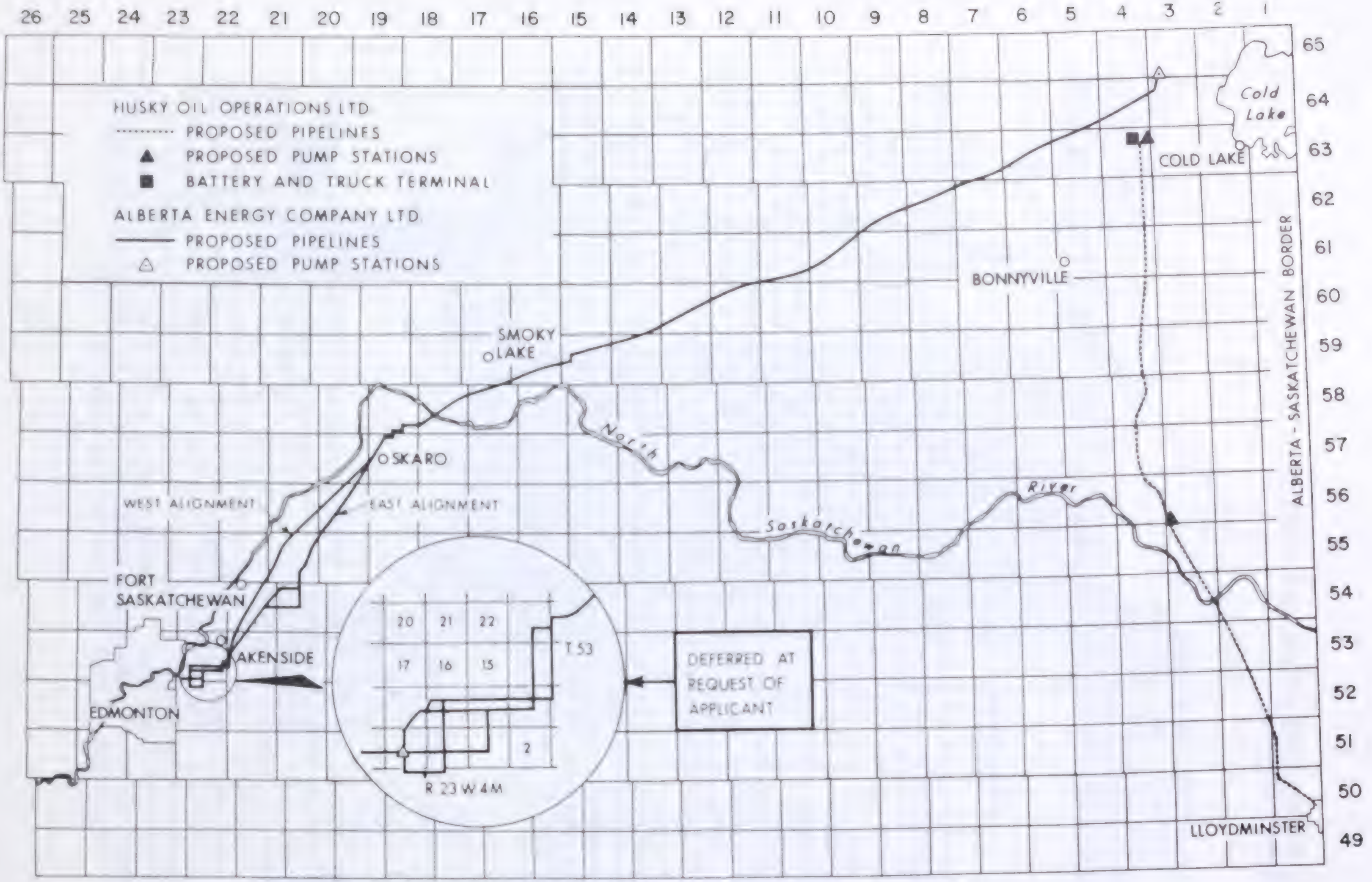

FIGURE 1 - PROPOSED PIPELINES - COLD LAKE - EDMONTON - LLOYDMINSTER

Husky also applied to build a truck pit and blending plant (Application 800897), which would serve as the source for the pipeline. The company proposed an initiating pump station at the blending plant and a mid-point pump station at Legal Subdivision 5, Section 6, Township 56, Range 3, West of the 4th Meridian.

2.2 Applications by AEC

AEC's applications proposed an operation somewhat similar to the Husky proposal. Crude bitumen would be blended with condensate in the Cold Lake area and then transported via pipeline to Edmonton. Pipelines would be required to transport the condensate from Edmonton to Cold Lake (Application 800741) and the crude bitumen-condensate blend from Cold Lake to Edmonton (Application 800742). The blend proposed by AEC is expected to be about the same as for the Husky proposal.

The expected maximum crude bitumen capacity of the blend line was given as 5900 m^3/d (ultimate capacity) with an initial capacity of 3600 m^3/d. Total blended volumes would therefore be approximately 8080 m^3/d and 4930 m^3/d respectively for each case assuming a 73/27 bitumen/diluent ratio.

The diluent line is proposed to be 168.3 mm O.D. while the bitumen blend line is proposed to be 323.9 mm O.D. The total length of each pipeline is approximately 235 km.

The company also applied to construct pumping and measurement facilities (Application 800807) at Esso Resources Canada Limited's (Esso) Leming Plant in Lsd 13-5-65-3 W4M. This facility would be the prime mover for the blended bitumen. A second pump station (Application 800806) is proposed in east Edmonton in Lsd 6-5-53-23 W4M to act as the prime mover on the condensate pipeline. The proposed condensate pump station site would be near the Trans-Mountain pipeline terminal.

3 HEARING AND APPEARANCES

A hearing to consider the applications was held in Edmonton from 20 January to 22 January 1981, with G. J. DeSorcy, P.Eng., V. E. Bohme, P.Eng., and N. A. Strom, P.Eng., sitting.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Husky Oil Operations Ltd. (Husky) F. R. Foran H. D. Williamson	H. J. Berry, P.Eng. R. Buchanan C. P. Mason A. R. Price, P.Eng. W. C. Thompson, P.Eng. H. A. Warnock, P.Eng. R. F. Wilhelm W. I. Willis, P.Eng.

THOSE WHO APPEARED AT THE HEARING (continued)

Alberta Energy Company Ltd. (AEC) J. W. Beames, Q.C.	M. Benson J. E. Ellefson, P.Eng. P. Glen D. Henley D. J. Johnson J. H. Russell, P.Eng. H. H. Purcell, P.Eng.
Amoco Canada Petroleum Company Limited (Amoco) F. B. Matthews, P.Eng.	
BP Exploration Canada Limited (BP) P. S. Carr, P.Eng., P.Geol.	
Dome Petroleum Limited (Dome) F. M. Saville	B. Anderson, P.Eng.
Imperial Oil Limited (IOL) W. A. Kennedy	
Murphy Oil Company Ltd. (Murphy) J. Kers, P.Eng. L. E. Pasychny	R. T. McLean, P.Eng. L. E. Pasychny
Petro-Canada Exploration Inc. H. G. Oliver	
Shell Canada Limited (Shell) R. M. Curtis	
City of Lloydminster	Hon. Mrs. K. Matheson, Mayor R. H. Brekko, P.Eng., City Commissioner
Edmonton Regional Planning Commission K. B. Clark	
Community Advisory Committee of the Cold Lake Region, Lakeland Environmental and Agricultural Protective Society, and Cold Lake-Bonnyville Local of the Central Trappers' Association (CAC). D. B. Appleby	D. B. Appleby Mr. Martin
Mr. Harold J. Mohr	
Landowners represented by Robertson, Baynton et al. (the Baynton Group) G. W. Baynton, Q.C.	J. Crepin J. D. Kelly
Schroter Family D. W. Matson	

Alberta Environment (AE)
D. Bratton, P.Eng.
R. Islam, P.Ag.

Energy Resources Conservation Board staff
D. Botterill, P.Eng.
M. J. Bruni
G. C. Dunn, P.Eng.
M. D. McDonald
J. K. Moloney

Submissions were also received from the following who did not appear at the hearing:
Landowners represented by
Ashton Hinz
Mr. C. S. Shirvell
Daon Development Corporation
North West Gas Co-op Ltd.
Nu-West Group Limited
Ram Holdings Co. Ltd.

4 GENERAL POSITION OF INTERVENERS

Although representations were made by several companies within the energy industry and for a variety of reasons, only two companies presented evidence. Dome did not oppose either pipeline, but expressed a concern to the Board that the use of pentanes plus proposed by the applicants should not be given priority at the expense of that required for pipeline transport of high vapour pressure liquids. This matter is discussed further in Section 11.4 of this report. Murphy, while not opposing the AEC applications, indicated that it would benefit from construction of the Husky pipelines since it held productive land near the proposed Husky pipelines. Murphy also indicated that having access to the Husky pipeline would accelerate and encourage the development of heavy oil on its land and in fact, it currently had plans to increase its heavy oil production to 800 m^3/d, given the proper incentives.

In closing argument, IOL supported AEC's application indicating there is no other pipeline facility capable of transporting Cold Lake crude bitumen to the Esso refinery at Edmonton. It was IOL's opinion that the use of a pipeline to transport the blended product would be environmentally superior to trucking, the only other alternative. IOL supported AEC's project, but took no position regarding the application by Husky.

Shell made representation respecting the route between Skaro and Edmonton. Shell said it was not contesting the need for the AEC pipeline, however, it currently has a pipeline application before the Board involving essentially the same route alternatives. Shell contended that Board approval of AEC's east alternative may prejudice later decisions to be made by the Board against Shell's preferred route, therefore, the decision respecting a route from Skaro west to Edmonton, should be deferred. This matter is dealt with later in the report.

Three interventions involving local issues were spoken to at the hearing. CAC did not oppose either application, however, it expressed concern regarding land use impacts resulting particularly from the AEC pipeline, and also brought forward documents containing typical measures which could be used to protect local interests. Section 11.3 includes a discussion of this request.

Mr. G. W. Baynton represented a group of landowners from the Lloydminster area who were intervening on the application by Husky. The concerns raised are discussed in detail in Section 11.1. Although the intervention did not contest the need for the pipeline nor oppose the applicant's route, it expressed concerns regarding conservation of agricultural soils and control of pipeline construction in wet weather.

Mr. Mohr, a landowner near Josephburg, was concerned that the AEC route, (east alignment), would impact upon the subdivision potential in the area and on development near Josephburg. Mr. Mohr appeared to be satisfied with the answers to his questions regarding re-routing the alignment around Josephburg and there does not appear to be a problem in this regard.

Mr. Matson, representing the Schroter family, questioned AEC witnesses in connection with the routing through his client's properties. Several parcels of land both to the north and south of the north boundary of Lsd 30-53-22 W4M are involved. This is near the portion of the line for which consideration was deferred at AEC's request. However, no evidence was presented and the AEC answers appeared to satisfy the concerns expressed.

Although other corporate and landowner interveners were represented at the hearing, no other party spoke to its intervention.

5 ISSUES

The Board considers the major issues of the applications to be:

(a) the purpose and need for each pipeline,
(b) the economic viability of each pipeline,
(c) the appropriateness of approving both pipelines,
(d) environmental impact,
(e) technical design and operation of the pipelines, and
(f) special matters raised by interveners.

6 NEED FOR THE PIPELINES

Both applicants indicated their proposed pipelines were necessary to transport the bitumen from the Cold Lake area to provide bitumen feedstock to the expanded Lloydminster and Strathcona refineries. Pipeline transportation of bitumen would eliminate or at least reduce existing and future traffic from trucks required to transport bitumen.

6.1 Husky

Husky believes a sufficient supply of bitumen in the Cold Lake area is available to supply its proposed pipeline. Husky's forecast as outlined in Table 6.1 indicates that 2700 m^3/d of bitumen would be available in 1984, with 3800 m^3/d available in 1991. The initial capacity of Husky's pipeline would be 3400 m^3/d.

Husky indicated its sources of supply would include Amoco, BP Exploration Canada Limited, Chevron Standard Limited., Gulf Canada Resources Inc., Norcen Energy Resources Ltd., Petro-Canada Exploration Inc., Suncor Inc. (Suncor), Uno-Tex Petroleum Corporation, and Husky. In its supporting intervention, Murphy indicated plans for expansion of the Lindbergh pilot to 800 m^3/d. Suncor (Fort Kent) and BP (Marguerite Lake) production were included in both Husky and AEC supply forecasts. Husky presently has no commitments for the supply of bitumen for its proposed pipeline. Husky plans to use its bitumen supply as a feedstock to its Lloydminster refinery and to a proposed upgrader facility and does not anticipate having bitumen in excess of the needs of these two facilities.

6.2 AEC

AEC indicated it has a twenty-year contract with Esso Resources Canada Limited to transport bitumen from Esso's Leming pilot project near Cold Lake to the Esso-Strathcona refinery in Edmonton. AEC's forecast, outlined in Table 6.1, indicated a bitumen supply of approximately 2500 m^3/d from this source. AEC also anticipated future bitumen supply from BP (Marguerite Lake) and Suncor (Fort Kent) whose combined production was forecast to be 1840 m^3/d. AEC did not include any other sources in its forecast supplies. The forecast volumes would compare to AEC's initial pipeline capacity of 3600 m^3/d of bitumen.

Suncor (Fort Kent) and BP (Marguerite Lake) production have been included in both Husky and AEC supply forecasts. AEC supply from Esso is under a twenty-year contract with a cancellation privilege of one year's notice if the Leming project is abandoned. AEC presently has no commitments from other operators for the supply of bitumen production for its proposed pipeline.

AEC indicated that any bitumen in excess of the 2000 m^3/d capacity of Esso's Strathcona refinery would be shipped to other markets. It said that an asphalt market on the west coast could use the excess bitumen as a feedstock.

TABLE 6.1 HUSKY AND AEC BITUMEN SUPPLY FORECASTS

(cubic metres per day)

	HUSKY			AEC		
YEAR	NON-HUSKY[1]	HUSKY	TOTAL[1]	ESSO	SUNCOR AND BP	TOTAL[2]
1982	817	-	817	2320	284	2604
1983	1037	-	1037	2505	254	2759
1984	2753	-	2753	2505	2131	4636
1985	2639	79	2718	2505	1921	4426
1986	2639	159	2798	2505	1841	4346
1987	2639	159	2798	2485	1841	4326
1988	2639	111	2750	2465	1841	4306
1989	2639	64	2703	2435	1841	4276
1990	2639	580	3219	2385	1841	4226
1991+	2639	1161	3800	2385	1841	4226

[1] Does not include Esso.

[2] Only includes Esso, Suncor and BP.

6.3 Overall Need

Based on the applicants' forecasts outlined in Figure 6.1, both pipelines would not be operated at capacity. However, based on the anticipated initial capacities of the pipelines, the forecast bitumen supplies for the area could not be handled by only one of the pipelines. Overall, the Board believes the operators' future forecasts for bitumen production from the Cold Lake area to be somewhat conservative and that the potential for activity in the Cold Lake area would eventually result in optimum utilization of both pipelines. The Board also anticipates the pipelines would improve the marketability of bitumen production as well as stimulate development of oil sands in the Cold Lake area. The Board is thus satisfied that there is a need for both of the applied-for systems.

7 ECONOMIC VIABILITY

The Board has analysed the economic viability of the proposed pipelines by comparing the expected tariffs with trucking costs. Using the capital cost and operating cost data supplied by the applicants, a stream of annual revenue requirements was calculated. Throughput projections were derived by allocating all of the Esso Leming pilot plant production, as forecast by AEC, to the AEC pipeline and all other production as forecast by Husky, to the Husky pipeline. The forecast of expected tariffs was then developed and converted to 1980 dollars. Because of the combination of high capital charges and low throughput in the first few years of operation, it would be necessary for Husky to reduce its tariff in the first few years and recover losses at a later date when throughput increases. The Board has therefore evaluated the economic viability of the Husky pipeline by calculating the real rate of return (before tax) to equity capital under the assumption that Husky would charge a tariff equal to the estimated cost of trucking (plus inflation) over the entire project life. It would be expected that if this rate of return were greater than Husky's average cost of capital, Husky would reduce its tariff in the later years and thereby reduce its rate of return to the appropriate level. The AEC proposal was evaluated by comparing the lifetime average tariff to current trucking costs. This procedure is sufficient in light of AEC's contractual arrangements with Esso.

The following tabulation illustrates the results:

	Current Cost of Trucking ($1980 \$/m^3$)	Lifetime (20 yr) Average Tariff ($1980 \$/m^3$)	Real Before Tax Rate of Return to Equity
AEC	\$10.50 - \$12.50	\$5.50 - \$7.50	N.A.*
Husky	\$ 6.00 - \$ 8.00	\$3.50 - \$5.50	15% - 30%

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* This calculation was considered inappropriate due to the nature of the AEC contractual arrangement with Esso.

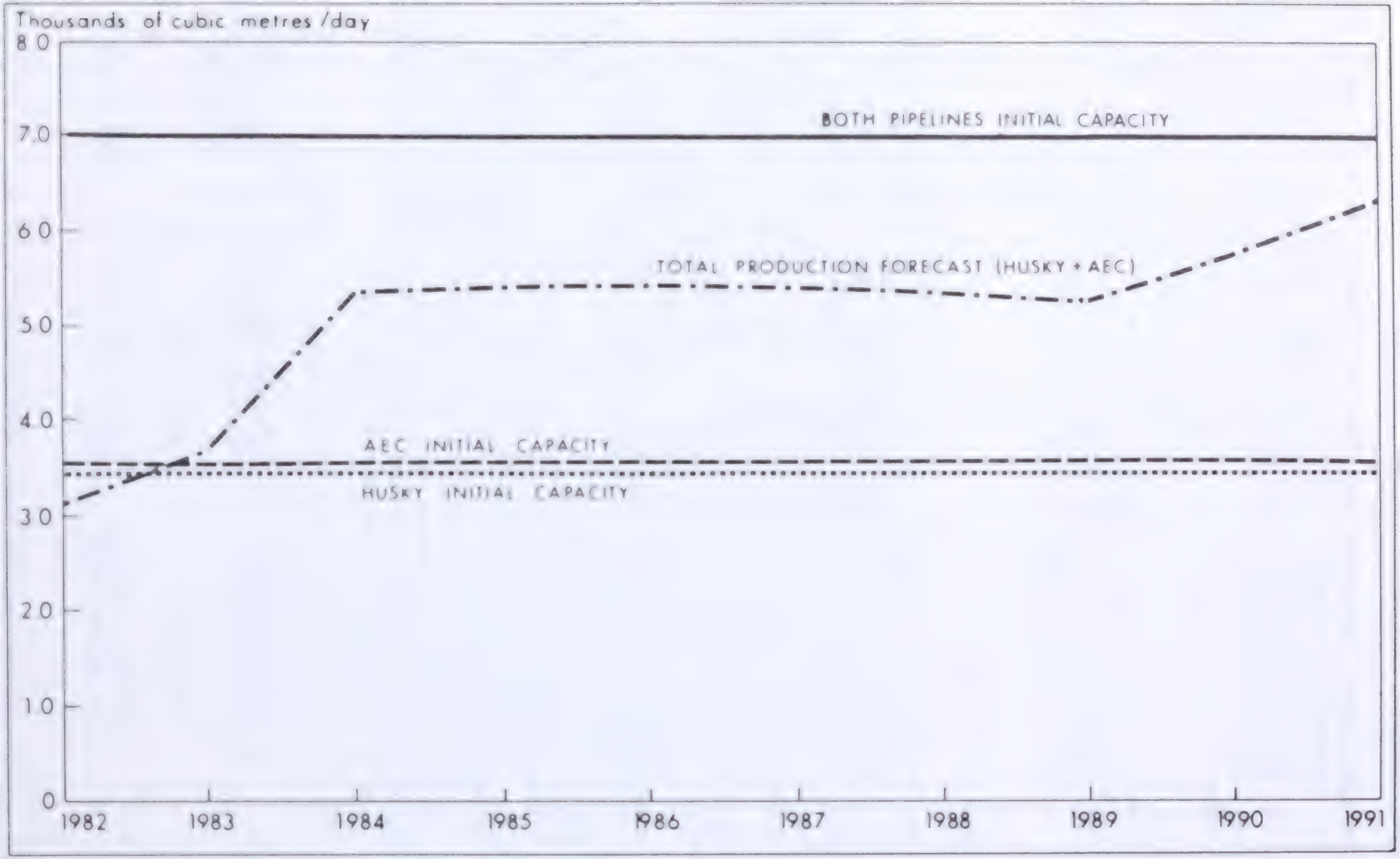

FIGURE 6:1 TOTAL COLD LAKE BITUMEN PRODUCTION AND INITIAL PIPELINE CAPACITY FORECASTS (ADOPTED FROM APPLICATIONS)

The range of estimates results from uncertainties associated with cost projections, capital charges, and taxes. The results indicate that both pipelines would be economically viable. Other factors which should enhance the commercial status of the proposals are:

(1) trucking costs should increase significantly over the next 20 years as a result of escalating fuel costs, while the effect on pipeline cost of service should be minor,

(2) the pipelines will likely be operating over a period much longer than the specified 20 years, and

(3) throughput volumes should exceed those utilized in the tariff evaluation after 1985.

8 APPROPRIATENESS OF APPROVING BOTH LINES

The two previous sections of this report have established the economic viability of, and need for, each of the proposed pipelines. Optimum development of service to the area must also include consideration of the timing of construction and completion of the lines. Since markets already exist in Edmonton for the AEC throughput, and production is available from Esso's existing pilot plants, the Board believes immediate construction of the AEC pipeline would constitute economic, orderly, and efficient development. Although the commercial viability of the Husky pipeline may be somewhat enhanced if construction were delayed for a year or two, the Board believes that earlier construction could stimulate production in the area and would therefore be in the public interest.

Having regard for the stimulation of production in the Cold Lake area and the availability of markets in Alberta, central Canada, the west coast of British Columbia, and the U.S.A., immediate approval of both lines is considered appropriate.

9 ENVIRONMENT

9.1 Husky

The Board believes the route chosen by Husky is satisfactory with the exception of a potential minor realignment to avoid interference with recreation facilities near Laurier Lake. The Board expects Husky and Alberta Recreation and Parks to select a mutually satisfactory alignment. The issues of topsoil salvage and construction practices which could cause lasting damage to the soil are dealt with in Section 11.1 of this report.

9.2 AEC

The Board generally agrees that the majority of the route selected by the applicant will not create significant adverse environmental impact. The Board recognizes, however, that the proposed pipeline may have some adverse effect on the recreational potential of a number of specific areas, namely between Moore and Tucker Lakes, between Garner and Floatingstone Lakes, and at the Sand and Beaver river crossings. These areas are considered to have potential for future recreation development and are relatively undisturbed by linear developments. Some minor route adjustments may be necessary in these areas and the Board expects that AEC would resolve routing concerns by discussion with Alberta Energy and Natural Resources (ENR) and Alberta Environment (AE). If the requested permit is issued, and if discussions between AEC, ENR and AE lead to minor modifications to the route proposed by AEC, the Board would expect to be informed and, if necessary, to receive requests for permit amendments.

10 TECHNICAL DESIGN AND OPERATION

10.1 Husky

Husky's pipeline design is based on the Canadian Standards Association CSA Z183-1977 "Oil Pipeline Transportation Systems" code. The applications proposed the use of CSA Z245.5, Grade 359, Category I and CSA Z245.3, Grade 317, Category I pipe, for the blend and condensate lines respectively. However, in direct examination, Husky indicated it intends to use Category II steel for both pipelines.

Although Husky anticipated transporting only non-sour blend and condensate, it expressed the opinion that new technologies involving crude bitumen recovery could slightly alter the properties of the raw crude to make it slightly sour. The company proposed to install vapour recovery and alkaline injection facilities to neutralize any acid gas which may be present in the crude bitumen. In addition, Husky proposed a closed truck dumping facility. Husky stated its intention would be to blend the crude bitumen and condensate prior to treating. This would provide higher capacity through the heater-treaters and greater efficiency in removing basic sediment and water. Additional condensate would then be added to the cleaned blend stream to produce a blend with an efficient pipeline viscosity.

Husky has provided for remote valve operation at major river crossing locations and is proposing a leak detection system based on alarm and shut-in if volume balancing shows a deficit in excess of a half of one per cent. A supervisory control system would take readings at nineteen second intervals and perform the volume balance calculation. Husky proposed a 122 cm (4 foot) depth of cover for the entire length of the pipeline system. This is slightly in excess of that required under the CSA Z183 standard for this type of pipeline. In response to questions regarding the possibility of erosion problems at the North Saskatchewan

River crossing, Husky stated that erosion had been considered and its view no unusual problem existed at the crossing site selected.

The Board has reviewed the design proposed by Husky and is in agreement with the design and criteria selected. The Board notes that the standards have been used as minimum standards and that the company has selected criteria over and above these based on its engineering judgement. The Board concurs with this approach.

10.2 AEC

The pipelines proposed by AEC are designed to meet CSA Z183-1977 "Oil Pipeline Transportation Systems" code, the same as noted in the application by Husky. In this case, the applicant is proposing to use CSA Z245.5, Grade 359, Category II pipe for both pipelines.

The proposed diluent/bitumen ratio would be approximately 27/73 with the prime governing factor being the blend viscosity. The maximum capacity figure was calculated using this diluent/bitumen ratio. Under questioning, AEC indicated that producers would be required to provide blending facilities and produce a blend of acceptable pipeline quality for shipping.

Valves with remote control operators would be located at strategic locations (major stream crossings). A supervisory control system was described which would scan data sources and provide a volume balancing calculation at one minute intervals. In response to geotechnical questions regarding stability of the southern approach of the North Saskatchewan River crossing, AEC's geotechnical consultant indicated that in his opinion the area of slumping was ancient. However, the area would require further investigation at the time of final design. The applicant agreed that further geotechnical investigations would be conducted and the results and recommendations would be forwarded to the Board and to AE.

The Board has reviewed the technical design and proposed method of operation and is satisfied with respect to both of these matters subject to a final review of the details of the North Saskatchewan River crossing.

11 SPECIAL MATTERS

11.1 Group of Landowners Represented by Robertson, Baynton et al

Witnesses for the Baynton group of landowners along the route of the proposed Husky pipeline stressed their concern regarding the effect of construction of the pipeline on soil condition and its future productivity. They indicated, from past experience, that pipeline construction causes compaction of subsoil, mixing of the topsoil and subsoil, and if pipeline construction is carried out in wet weather, irreparable damage to the soil. The group recommended the Board include in any permit granted for the construction of the pipeline, conditions stipulating that an independent agrologist be hired by the Board to recommend reclamation methods and procedures, supervise pipeline construction to ensure that procedures are followed, and to stop pipeline construction in inclement weather in order to prevent permanent damage to the soil. As an alternative the group requested topsoil be stripped from the entire pipeline right of way. It also requested that Husky be prohibited from construction when the soil on the right of way is wet or frozen. The group acknowledged that the procedures outlined by Husky for reclamation of the topsoil were reasonable but indicated some doubt that priority would be given to preservation of agricultural soil over completion of pipeline construction. They also claimed the soil survey completed by Husky was not adequate and should be upgraded before reclamation procedures are defined.

Husky contended that it had proposed adequate measures to ensure protection of the topsoil. It stated that stripping the topsoil from the ditch line and under the spoil pile was the best method to ensure the least mixing and compaction of soils. Husky indicated that stripping the whole of the right of way would do more damage to the soil than would stripping the portion above the ditch and below the spoil pile. Husky stated that it intended to construct the pipeline before freeze-up and that it would stop construction of the pipeline in inclement weather if it believed it would do irreparable damage to the soil. It also stated that the proposed method of construction with respect to soil preservation practices would be reviewed with its pipeline inspectors in the presence of an agrologist.

The Board acknowledges the importance of agricultural land to the farmer and to the economy of Alberta and Canada, and believes that it must be protected from damage wherever possible. The Board does not consider it likely that a pipeline could be constructed across agricultural land without some impact on the soil, but does believe that this impact can be kept to a minimum so that two or three years of cultivation would likely return the soil to its former productive capacity. The Board also acknowledges the concern of the Baynton group that construction procedures do not always place preservation of topsoil ahead of other considerations and that serious damage to the topsoil could result. The Board, however, is not convinced that hiring an independent agrologist to supervise reclamation methods and pipeline construction is appropriate and will not require this in any permit issued.

The Board believes that construction and reclamation procedures designed to protect the topsoil are essential if serious damage to the topsoil is to be prevented. The Board agrees that, on the whole, Husky has proposed a method that if followed, would afford the protection required. The Board is not certain that stripping of the entire right of way provides maximum soil conservation and in this case believes that other methods are more appropriate. On the other hand, the Board agrees with the Baynton group that Husky must do a thorough job of identifying the soils along the right of way and that this work must be performed by qualified specialists prior to the start of construction.

The Board believes that its Pipeline Inspector, together with a member of the Land Conservation and Reclamation Council should monitor Husky's construction methods and the weather conditions during construction. If in their opinion these factors might cause irreparable damage, the Pipeline Inspector would halt any construction operation causing damage. The Board will make reference to the matter of soil preservation in any permit issued to Husky.

11.2 Deferral of Route Considerations - Skaro-Akenside Section

Shell requested that the Board defer its decision with respect to the east and west alternatives of the AEC route from Skaro to Akenside. Alternatively, Shell requested that the Board grant AEC's application without prejudice to Shell's preferred west alternative proposed in its application currently before the Board. The east alternative parallels the CPR railway track whereas the west alternative parallels eight existing pipelines near the Town of Fort Saskatchewan.

AEC contended that the applied-for route was chosen on the basis of discussions with Alberta Environment and the Edmonton Regional Planning Commission. Although AEC stated that there is good and sufficient reason to support the east alternative, it did not identify the reasons. AEC stressed that there was no reason to defer the portion of line from Skaro to Akenside.

The Board notes Shell's request to defer the Skaro-Akenside portion of AEC's route and acknowledges it has received an application from Shell for a permit to build a pipeline along AEC's west alternative. It also notes that although Shell stated that alternatives were considered, it prefers to follow the west alignment. The Board is of the view that the east and west alignments both may be considered "corridors" in that one follows existing pipelines while the other follows the railway. However, the Board believes there are uncertainties regarding the most appropriate of the two.

The Board has in mind the separate requests to follow each of the alignments, the uncertainties regarding the appropriateness of each one, the Board's preference for the use of corridors, the potential for additional pipelines to be constructed in the area, and the Board's preliminary view that they should all go in one corridor. The Board is also aware that the western 16 kilometres of the Skaro to Edmonton segment of the line is already deferred and is to be considered at a further hearing and that the decision on that portion of the line could conceivably affect the appropriate location of the segment from Akenside to Skaro. For these reasons, and because the matter was not explored in detail at the subject hearing, the Board concludes there is not sufficient information before it at this time to decide which route is most appropriate.

11.3 CAC

Mr. Appleby, representing CAC, indicated general support for both pipeline projects, however, cautioned about the manner, timing and attitude to construction, including the effect on landowners and trappers. He stressed that overall planning should be used for development of projects in an area including the use of multi-purpose corridors. Mr. Appleby stated that any pipeline project should be designed so that it is adequately sized to accommodate future needs. He also requested that the Board determine appropriate terms and conditions to be attached to permits granted to the applicants.

The Board believes it should not attach conditions to permits unless individual circumstances warrant it and is not prepared to extract general conditions from other approvals. The Board has Pipeline Regulations that cover many general concerns regarding pipeline construction and it will add conditions to a permit where the regulations do not cover items requiring special consideration.

11.4 Dome

Dome expressed concern over the availability and alternative uses of pentanes plus. While it stated its belief that sufficient quantities would be available to meet Alberta's requirements for several years, it requested that the Board not assign priority to the use of pentanes plus as a diluent in the transportation of heavy oil over its use by Dome both as a buffer and to reduce vapour pressure in its pipeline operations.

The Board believes that efficient utilization of pentanes plus, with respect to the above alternatives, should be determined as necessary and will not recommend priorities at this time. If permits are issued to the applicants, there would be no related commitment as to the future availability of pentanes plus.

12 CONCLUSIONS

The Board believes that the pipelines proposed by both Husky and AEC are necessary, are economically viable, and are in the public interest. Although minor route changes may be required they would have only a minor impact on the economic viability of the proposed lines.

The Board concludes that the general routing of the Husky pipelines is appropriate although minor site-specific route changes may be required.

With respect to the AEC proposal, the Board concurs with the general routing between Cold Lake and Skaro subject to minor site-specific alterations but believes the route between Skaro and Akenside has not been adequately addressed and needs further evaluation. The Board requires additional information on the so-called east and west alignments (see Figure 1), and intends to consider the additional information at the same time it considers the Shell application referred to earlier in this report and the portion of the AEC application which was deferred at the applicant's request.

The Board will not designate any priorities respecting the use of pentanes plus in the proposed systems.

The Board will condition any permits granted by it for the proposed Husky pipelines to ensure soil conservation is given adequate consideration.

The technical design and proposed operation of the pipelines are adequate with the exception of AEC's proposed crossing of the North Saskatchewan River where further investigation is required.

13 DECISION ON HUSKY APPLICATIONS

The Board approves Applications 800561, 800562, and 800897 by Husky Oil Operations Ltd. The Board is requesting the approval of the Minister of Environment, and upon receipt thereof will issue the appropriate permits and approvals. Any permit issued to Husky for Applications 800561 and 800562 would contain a condition generally as set out in Appendix 1 plus any conditions included in the Ministerial Approval.

14 DECISION ON AEC APPLICATIONS

The Board approves Applications 800806 and 800807 by Alberta Energy Company Ltd., for permits to construct pump stations in the Edmonton and Cold Lake areas and approves, in part, Applications 800741 and 800742 also by Alberta Energy Company Ltd. The Board is requesting the approval of the Minister of Environment respecting the pump stations and respecting the pipelines from Lsd 13-5-65-3 W4M (Cold Lake) to Lsd 3-29-57-19 W4M (Skaro) and upon receipt thereof will issue the appropriate permits. Any permit granted to AEC for Applications 800741 and 800742 would contain a condition generally as set out in Appendix 2 plus any conditions included in the Ministerial Approval. The decision respecting the route of the pipelines between Lsd 3-29-57-19 W4M (Skaro) and the north boundary of Section 30-53-22 W4M is deferred.

DATED at Calgary, Alberta on 3 April 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy, P.Eng.
Vice Chairman

V. E. Bohme, P.Eng.
Board Member

N. A. Strom, P.Eng.
Board Member

APPENDIX 1
FORM OF CONDITIONS (HUSKY)

ATTACHMENT TO PERMIT NO.

1 The permittee shall plan and develop its construction methods so as to ensure the least possible adverse impact to the productivity of the soil.

2 The permittee shall cease construction of the pipeline during inclement weather if it appears work on the right of way will cause irreparable damage to the soil.

ATTACHMENT TO PERMIT NO.

1 The permittee shall submit details of further investigation of the North Saskatchewan River crossing location to the Board and to Alberta Environment for approval prior to commencing construction of the crossing.

ENERGY RESOURCES CONSERVATION BOARD
Calgary, Alberta

EXTENSION OF SERVICE AREA
THE CITY OF MEDICINE HAT

Decision 81-8
Application 810047

1 THE APPLICATION AND HEARING

The City of Medicine Hat applied to the Energy Resources Conservation Board, pursuant to section 20 of The Hydro and Electric Energy Act, for approval to extend its service area to include the northeast, southeast, and southwest quarters of 11-12-6-W4M, in order to provide three-phase electric service to the farm of Mr. H. Felesky. These quarter sections are currently within the service area assigned to Calgary Power Ltd.

Following publication of notice, the Board received an objection from Calgary Power Ltd. opposing the takeover of this portion of its service area by The City of Medicine Hat. The Board, therefore, conducted a public hearing respecting the application. The hearing was held in Medicine Hat on 1 April 1981, with C. J. Goodman, P.Eng., T. F. Homeniuk, P.Eng., and J. R. Pow, P.Eng., sitting.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
The City of Medicine Hat (City) J. W. Kerr, P.Eng.	J. W. Kerr, P.Eng. J. John, P.Eng.
Calgary Power Ltd. (Calgary Power) H. M. Kay	D. Lyons, P.Eng. E. W. Smith, P.Eng.
H. Felesky	H. Felesky
Energy Resources Conservation Board staff D. A. Holgate, Solicitor D. G. Beamer, C.E.T.	

Calgary Power and the City both stated that the most practical and economic source of supply to Mr. Felesky's farm is the City's adjacent 13.8-kV distribution line.

The City stated that according to Mr. Felesky, he had been advised by Calgary Power to request electric service from the City. The City further stated that the service location requested by Mr. Felesky is approximately 10 metres (30 feet) from its existing 13.8-kV distribution line. Since Calgary Power had advised Mr. Felesky to obtain service from the City, the City contended that Calgary Power had acknowledged that it was in the customer's best interest and therefore in the public interest to have the Felesky service connected to the City's electric distribution system.

The City said it was not prepared to accept Calgary Power's proposal to provide service to Mr. Felesky on a "temporary basis" until Calgary Power expanded its own facilities into the area. It emphasized that since it was willing to install and maintain the service to Mr. Felesky as long as required, and because of the proximity to its existing 13.8-kV distribution line, it doubted whether Calgary Power would ever have cause to expand into this area. The City, therefore, submitted that its service area should be extended to include the three quarter sections of Mr. Felesky's farm.

Calgary Power stated that it did not object to the City providing Mr. Felesky with individual electric service inside Calgary Power's service area, since it seemed to be the most practical alternative, but it opposed the extension of the City's service area. Calgary Power stated that there are numerous instances of a utility serving individual customers within another utility's service area. These arrangements are usually effected by mutual agreement, with the operator of the service area reserving the right to eventually serve the customer when it becomes practical to do so. Calgary Power said it was prepared to enter into a similar arrangement with the City. Calgary Power also stated that the City had not advanced any reasons to demonstrate that it is in the public interest to alter the service area boundary in the proposed manner.

Mr. Felesky's only concern was that he receive the most economical electric service within the next few weeks.

3 VIEWS OF THE BOARD

3.1 Issues

The Board is of the opinion that it has two main issues to consider in this matter. The first is the need for an adequate supply of electric energy, within an established service area, to a customer who has expressed a need for that supply prior to the end of April 1981 and who has been attempting to obtain that supply since sometime before early January 1981. The second issue is whether there is adequate reason to alter the existing assigned service areas of the electric distribution systems of Calgary Power and the City in the vicinity where the particular electric service is required.

With respect to the first issue, the Board notes that, upon the request of a customer within an operator's service area, the operator may serve its potential customer from its electric distribution system or, if that is not practical, proceed at once to enter into an agreement with another electric utility so that the customer may be served from that other utility's system. Where such a mutual agreement is reached between utilities, and unless there are strong reasons to the contrary, the Board would move quickly to approve the arrangements to supply electricity to the customer.

With respect to the second issue, where an electric utility operator makes application for approval of an electric distribution system and service area within an area not previously assigned to any operator, the Board would consider the pertinent related matters including its previous written information to the operators and would likely approve the distribution system and service area of the operator who would serve the customer.

Where an application being considered under sections 20 and 21 of the Act involves previously assigned service areas then, in addition to those matters previously referred to, the Board believes there must also be convincing reasons and reasons in the public interest before it would alter a service area boundary to, in effect, transfer part of the service area of one operator to that of another.

3.2 Findings

The Board is of the opinion that it is important to provide service as soon as possible to Mr. Felesky's farming operations. Unfortunately, an agreement was not negotiated between Calgary Power and the City to expedite the service. Having considered all the evidence in this particular matter, the Board finds that service to Mr. Felesky's operations from the City's distribution system is the most practical alternative.

In the absence of an agreement between the two operators, the Board is prepared to authorize the City to supply an individual electric service within the service area assigned to Calgary Power.

The Board has carefully considered the related evidence and the application by the City to alter its service area to include three additional quarter sections of the Felesky farm, but is not convinced that in this instance there are compelling reasons in the public interest to alter the boundary between the service areas of the two operators.

4 DECISION

1 The Board is prepared to approve an individual electric service by The City of Medicine Hat at a point near the boundary between the northeast and southeast quarters of section 11-12-6-W4M, to serve a farm presently operated by Mr. H. Felesky.

2 No alteration is to be made at this time to the boundary between the existing service areas assigned to The City of Medicine Hat and to Calgary Power Ltd.

ISSUED at Calgary, Alberta, on 9 April 1981.

ENERGY RESOURCES CONSERVATION BOARD

C. J. Goodman

C. J. Goodman, P.Eng.
Board Member

Homeniuk

T. F. Homeniuk, P.Eng.
Acting Board Member

J. R. Pow, P.Eng.
Acting Board Member

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

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APPLICATION BY
DOME PETROLEUM LIMITED FOR A
WELL LICENCE IN THE PARADISE FIELD

Decision 81-9
Application 810172

1. INTRODUCTION

1.1 Background

On 12 February 1981, Dome Petroleum Limited (Dome) submitted an application for a licence to drill the well DOME PARADISE 9-8-47-2. In its application, Dome stated that it had the right to drill for oil and gas in all of Section 8, Township 47, Range 2, West of the 4th Meridian, down to and including the Devonian. The application further stated that the purpose of the well would be to obtain production from the Cummings Member.

On 18 February 1981, Hudson's Bay Oil and Gas Company Limited (Hudson's Bay) submitted a letter to the Board requesting that the Board not issue a licence to Dome that would allow production from or above the Cummings Member. Hudson's Bay explained in its letter that it was the lessee of all petroleum and natural gas rights underlying Section 8, Township 47, Range 2, West of the 4th Meridian. It stated that it had the producing well, HBOG UGAS PARADISE VALLEY 10-8-47-2, in Section 8 in the Cummings Formation which was within the same quarter section drilling spacing unit as the well for which Dome was making application.

This existing well was interpreted to be completed in the Paradise Cummings A Pool, and the Board's records showed that it had obtained some minor and sporadic oil production from the pool. The Board took the position that section 24(3) of The Oil and Gas Conservation Act, prohibits a person from applying for a licence to drill and complete a well in a pool in a drilling spacing unit in which there already is a well capable of production, and accordingly, on 24 February 1981, returned the application.

1.2 The Application and The Hearing

On 26 February 1981, Dome applied pursuant to section 41(1) of The Energy Resources Conservation Act for a hearing respecting the Board's decision to return the application for a licence for the well DOME PARADISE 9-8-47-2.

A public hearing of the application was held on 2 April 1981 with V. E. Bohme, P.Eng., G. A. Warne, P.Eng., and R. G. Evans, P.Eng., sitting.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Dome Petroleum Limited (Dome) A. L. McLarty	J. M. Barclay A. P. Cachero, P.Eng. R. N. McMannus, P.Geol.
Hudson's Bay Oil and Gas Company Limited (Hudson's Bay) M. V. McDill Miss L. Fryers	W. DeBoni, P.Eng. C. W. Fischer, P.Eng.
Energy Resources Conservation Board staff K. F. Miller G. D. Agnew N. E. Sitland	

2 CONSIDERATION OF THE APPLICATION

2.1 Applicant's Views

Dome stated that while the Hudson's Bay well in LSD 10 is completed in the Cummings Member and has produced some oil, its production history indicates the well is clearly incapable of significant production and that Section 24(3) of The Oil and Gas Conservation Act would not prohibit the issuance of a well licence to Dome for the proposed well in LSD 9. In support of its views, Dome presented data to show that the well had not produced significant amounts of oil for quite some time, and was in effect a suspended oil well. It stated that although the Hudson's Bay well had produced a small quantity of oil and might still be capable of producing minor amounts, this did not qualify it as capable of production since the production rates achieved were very low and unlikely to improve to the point of being economically viable.

Dome further submitted that it had applied for more than just a licence to obtain production from the Paradise Cummings A Pool. It stated that under the contractual arrangement with Hudson's Bay, it could earn the right to other formations both above and below the Cummings by the drilling of the proposed well. Dome further contended that should the Board find the Hudson's Bay well was producing or capable of producing, a well licence should still be issued to Dome but that the Board should condition the licence to prohibit production from the Cummings Member. Dome added that it could earn the rights to a zone below the Cummings Member by the drilling of the well, and to other zones that may be productive including the Lloydminster and McLaren sands which are above the Cummings Member.

2.2 Intervener's Views

Hudson's Bay said there was no question with regard to the capability of the well to produce oil, since immediately prior to the hearing, the well was producing at the rate of 0.5 m^3 per day. Hudson's Bay stated that it was attempting to improve the production rate while continuing to produce the well. Hudson's Bay explained that the sporadic production and long shut-in periods in the past were due to mechanical difficulties encountered at the well. An example of such difficulties was the jamming of the pump with rubber from a torn packer.

Hudson's Bay said that even a very small amount of oil produced by a well should be considered as production even though it might not be economic or continuous. Hudson's Bay expressed optimism that its well would produce at the current rate of 0.5 m^3 per day for some time to come and that attempts to improve the production of the well would perhaps result in an economic operation.

Hudson's Bay took the position that since the well was producing, the Board's decision to return Dome's application was correct. It added that Dome's application was in fact made in contravention of section 24(3) of The Energy Resources Conservation Act. Hudson's Bay stated that it had no objection to the Board issuing a licence to Dome for the purpose of evaluating, and/or producing from zones below the Cummings Member and reiterated that it had made this position known to Dome prior to the well licence application being made.

2.3 Board's Views

The Board believes that the key issue in the application is whether or not Dome applied for a licence for a well for the purpose of obtaining production from the same pool as that from which another well is obtaining or capable of obtaining production in the same drilling spacing unit. If Dome did apply for such a licence in its application for the well, DOME PARADISE 9-8-47-2, unless there were special circumstances, the Board could not entertain the application in view of the prohibition contained in section 24(3) of The Oil and Gas Conservation Act.

In assessing the evidence regarding the producing capability of the well, HBOG UGAS PARADISE VALLEY 10-8-47-2, the Board is satisfied that although its history indicates low and intermittent oil production since it was first completed, Hudson's Bay has continued its efforts to improve the quality of the well and the recent production rates indicate a well capable of producing measurable quantities of oil. In addition, the evidence regarding the mechanical difficulties of the well provides some explanation of the low and intermittent nature of past production. The Board concludes that for the purpose of section 24(3) of the Act, the Hudson's Bay well is "obtaining or capable of obtaining production" and that Dome's application for a well licence in the same drilling spacing unit in the same pool can not be accepted.

With regard to Dome's request that the Board issue the licence conditioned to prohibit production from the Cummings sand, the Board does not believe the issuance of the conditioned well licence would be appropriate without the receipt of a new well licence application, because the subject application expressly provides for production from the Cummings. The right to make a new well licence application would be governed by section 25(1)(c) of The Oil and Gas Conservation Act.

3 DECISION

The Board confirms that the return of the application to Dome on 24 February 1981 was appropriate since section 24(3) of The Oil and Gas Conservation Act, prohibits Dome from making an application for a licence for the well, DOME PARADISE 9-8-47-2, to produce from the Cummings sand. The Board is not prepared to issue the licence with a condition prohibiting production from the Cummings sand.

DATED at Calgary, Alberta on this 11th day of June, 1981.

ENERGY RESOURCES CONSERVATION BOARD

Bohme

V. E. Bohme
Board Member

Warne

G. A. Warne
Acting Board Member

Evans

R. G. Evans
Acting Board Member

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

THE ALBERTA GAS ETHYLENE COMPANY LTD.
INDUSTRIAL DEVELOPMENT PERMIT
TO MANUFACTURE ETHYLENE

Decision 81-10
Application 800853

1 INTRODUCTION

The Alberta Gas Ethylene Company Ltd. (AGEC) applied, pursuant to section 42, subsection (2), of The Oil and Gas Conservation Act (the Act) for an industrial development permit which would authorize the use of ethane as feedstock and gas as fuel to manufacture ethylene. AGEC proposed to construct a third ethylene plant adjacent to its present facilities near Joffre.

1.1 Background

In April 1975, AGEC applied for a permit for its first ethylene plant (Unit 1) at Joffre. Following a public hearing of the application in Red Deer, Alberta, the Board issued a decision favouring the proposal in ERCB Report 75-N[1]. Industrial Development Permit No. AGE 76-1 was subsequently granted with the approval of the Lieutenant Governor in Council. The plant started producing ethylene in the latter part of 1979.

A second ethylene plant (Unit 2), similar to the first in design and capacity, was proposed by AGEC in an application to the Board dated 7 September 1979. The application was advertised for objections and none were received. By further application dated 22 October 1980, the proposal was amended to include the addition of two cracking furnaces, separation facilities for the propane by-product stream and an increase in capacity of the distillation train. Both applications dealing with the second plant were subsequently approved and Industrial Development Permit No. AGE 79-2 was issued 12 March 1981.

A separate application by NOVA, AN ALBERTA CORPORATION and Shell Canada Limited, respecting their proposal to build a polyethylene plant on the AGEC Joffre site, was originally scheduled to be heard at the conclusion of proceedings respecting the third AGEC ethylene unit. At the request of an intervener, the NOVA/Shell hearing was deferred until 28 April 1981 to allow additional time for study of the polyethylene plant proposal.

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[1] In the Matter of Applications of The Alberta Gas Ethylene Company Ltd., Du Pont of Canada Limited, Dow Chemical of Canada, Limited and Canadian Industries Limited All Under Section 42 of The Oil and Gas Conservation Act. ERCB Report 75-N, November 1975.

This report deals with the application of AGEC to build the third ethylene plant (Unit 3) on its Joffre site.

1.2 The Hearing

A public hearing of the application was held in Red Deer, Alberta, on 7 and 8 April 1981, with G. J. DeSorcy, P.Eng., N. Strom, P.Eng., H. J. Webber, P.Eng., and H. M. Douglas, P.Ag., sitting. Mr. Douglas is an Assistant Deputy Minister of the Department of Agriculture, and was appointed an Acting Board Member for purposes of dealing with the subject application.

The hearing participants are listed in Appendix A - Those Who Appeared At The Hearing, along with abbreviations used in this report.

2 APPLICATION

The industrial development permit applied for by AGEC would authorize the annual use of 2.773 x 10^6 cubic metres (m^3) of ethane as feedstock, and 562 x 10^6 m^3 of gas as fuel, to manufacture 748 000 tonnes of ethylene. The applicant's ethane feedstock requirement was based on the assumption that the proposed plant's inlet feed stream would be 94 weight per cent ethane, in keeping with the general definition of ethane under section 2(1)16 of the Act. Ethylene would be transported to Fort Saskatchewan using an existing pipeline, where it would be stored in underground caverns until sold for further upgrading or removal from Alberta. AGEC requested that the permit be issued for a term of 20 years commencing with plant start-up projected for the third-quarter of 1985.

Unit 3 would be similar in basic process design to Unit 1 and Unit 2, with the ability to process feedstock augmented with up to 20 per cent propane. Unlike Unit 1, however, it would have facilities to separate the propane by-product stream into propylene and propane. The applicant submitted that plant production is expected to be approximately 10 per cent greater than nominal design capacity of 680 000 tonnes per year. This would result in the production of up to 748 000 tonnes of ethylene per year. Fuel gas volumes requested in the application were based on the assumption that all by-products of the plant would be processed or sold rather than used as fuel. AGEC submitted that it would apply to the Board for an amendment to its permit if priorities developed such that utilization of some propane in the feedstock becomes prudent. AGEC submitted that through existing contracts and other contracts presently being negotiated, it was in the process of securing adequate ethane feedstock supplies to satisfy its requirements, and that it was also investigating a number of sources for the supply of fuel gas for the proposed plant.

The applicant submitted that it expected most of the ethylene produced by the proposed plant to be upgraded in Alberta, with surplus volumes to be sold in other parts of Canada or placed in the export market. AGEC stated that equity financing of the proposed project is expected to be provided mainly from its own internally-generated funds, but that financing packages from all competitive sources would be evaluated. AGEC submitted that it was incorporated under the Companies Act R.S.A., 1970, Chapter 60, on 2 May 1974, and that it is a wholly-owned subsidiary of NOVA, which was incorporated by The Alberta Gas Trunk Line Company Act, S.A. 1954, C. 37, as amended.

The site on which Unit 3 would be located is in sections 29, 31, and 32, township 38, range 25, west of the 4th meridian, approximately 19 kilometres east of Red Deer. Appendix D to this report is a map showing the location of the proposed ethylene plant which would be on the existing AGEC plant site near Joffre.

3 GENERAL POSITION OF INTERVENERS

PAL submitted that industry should be utilizing poorer quality land for its processing plants and related services, saving better land for the production of food. While not objecting to the proposal of AGEC in an absolute sense, PAL maintained that the build-up of population along the Highway No. 2 corridor should be diverted to poorer quality land and around smaller communities which need development. PAL also expressed concern over the increased traffic and the weight of loads which would be imposed on country roads during the plant construction period.

The Commision stated that, while it was concerned about the number of petrochemical plants proposed for the Red Deer area, it did not oppose the location of AGEC's third plant.

Sulpetro, Gulf, Esso Resources, and Texaco affirmed their desire to retain ownership and distribution rights to ethane in natural gas streams which AGEC listed as potential feedstock sources.

In closing argument, the joint venture companies of AEC/Esso and AEC/Du Pont both stated their recognition of the importance of continued development of ethylene capacity in Alberta.

Union Carbide, Dow, Celanese, and the joint venture company of NOVA/Shell all supported the AGEC application.

4 ISSUES

Having regard for its responsibilities under section 42 of the Act, the Board considers the issues to be:

a the availability of ethane and gas in Alberta, and their efficient use in the proposed project,

- b the environmental and social impact of the project, including the location of the proposed project,
- c the markets for ethylene and the potential for the further upgrading of energy resources in Alberta, and
- d the economic impact of the proposed project on the Alberta economy.

5 AVAILABILITY AND EFFICIENT USE OF ENERGY RESOURCES

5.1 Availability of Fuel

AGEC proposed to use gas as fuel and applied for authorization to use volumes of gas sufficient to meet its needs should all plant by-product streams be marketed rather than used for fuel. AGEC stated that it was investigating a number of sources for its required supply of fuel gas and would undertake to advise the Board as to arrangements that are concluded for this supply.

The Board is satisfied that supplies of gas in Alberta will be adequate for the proposed use over the requested permit term. While the Board would be prepared, should a permit be issued respecting this application, to authorize the use of the applied-for volumes of gas, it would require that AGEC satisfy the Board, prior to plant start-up, as to the arrangements for the supply of the required gas volumes, as to the volumes of gas to be used as fuel including that used in place of plant by-product streams, and with respect to the suitable disposition of the off-gas and liquid by-product streams.

5.2 Availability of Feedstock

5.2.1 Views of AGEC

The applicant proposed to utilize ethane as feedstock for the proposed plant although the design would allow for the use of up to 20 per cent propane in the plant feedstock. Feedstock requirements would be 2.773 x 10^6 m^3 of total mixed feed based on a feedstock ethane content of 94 weight per cent.

AGEC stated that its current contracts for ethane supplies would not be sufficient to meet the combined requirements of its existing permits and the proposed third plant. The applicant stated that it was in the process of securing additional quantities of ethane recoverable from both the processing of additional volumes of gas being removed from Alberta and the processing of gas serving Alberta's requirements.

The applicant presented a forecast of ethane availability from existing extraction plants, from deeper cuts at existing extraction plants, and from potential new sources. This forecast is summarized in Appendix B of this report. The potential new sources include the processing of additional volumes of gas serving both Alberta and ex-Alberta requirements as well as ethane potentially recoverable from the processing of crude oil and synthetic crude oil. AGEC also prepared a forecast of ethane demand in Alberta which included the applicant's requirements for its operating, approved, and proposed ethylene facilities, the two existing ethane removal permit commitments, and an estimate of ethane requirements for miscible-flood crude oil recovery schemes in the province. A comparison of the applicant's ethane supply and demand forecasts indicate that ethane supplies in the province would be sufficient to meet the needs of the proposed plant over the requested permit term.

AGEC stated that the recovery of ethane at the field processing plants mentioned in the application as processing gas serving Alberta's requirements would have only a minimal effect on ethane recovery at straddle plants. However, AGEC acknowledged that extraction of ethane at field processing plants other than those listed in the application could affect ethane recovery at straddle plants to the extent that such processing receives regulatory approval. The applicant stated that it would be willing to negotiate for the purchase of ethane recovered by field processors and would also be willing to accept a risk respecting future feedstock availability.

5.2.2 Views of the Interveners

Esso Resources stated in closing argument that ethane supplies from existing extraction plants and proposed deep-cut facilities at existing plants would not be sufficient to meet the applicant's needs and further stated that AGEC would still have to contract an additional 25 to 50 per cent of its feedstock requirements for its third plant from new sources. Esso stated that the applicant's supply situation should in no way impact on the rights of Esso Resources to extract ethane at its field processing plants and to dispose of such ethane within the province to the applicant or any other purchaser.

Gulf also observed that sufficient ethane for the applicant's proposed project had not been contracted for. Gulf further stated that it is for the Board to determine whether ethane is available in sufficient quantities for the applicant's requirements, and that it is for the applicant to absorb the risk that, even if a sufficient supply exists, it may not be for sale.

In closing argument, Texaco stated that any permit issued respecting AGEC's application should indicate that it does not guarantee a feedstock source by interfering with the proprietary rights of producers to extract and process their own ethane. Texaco also stated that consent by AGEC to act as a custom processor for ethane could be an attractive solution for securing adequate feedstocks.

5.2.3 Views of the Board

The Board, having regard for the evidence presented at the hearing, has estimated future potential ethane supply in Alberta based on ethane available from the processing of gas and the production of synthetic crude oil. As well, it has estimated Alberta's future demand for ethane. The details of the Board's supply and demand forecasts are given in Appendix B. Table 5-1 compares the Board's estimate of total potential ethane availability with the requirements of currently-approved facilities, the requirements of AGEC's proposed plant, volumes authorized for removal from Alberta, and the Board's most recent estimate of ethane requirements for miscible-flood schemes in the province. On the basis of this comparison, the Board believes that sufficient supplies of ethane could be made available in Alberta to meet the requirements of AGEC's proposed plant over the applied-for term of permit.

As the Board has noted in previous reports, however, while it has not been Board policy to issue permits for the use of energy resources in excess of those volumes that in the Board's best judgement will be available, the Board does not see the issuance of an industrial development permit as an automatic allocation of resources to the holder of an industrial development permit. The Board expects that a permittee would make the necessary arrangements to secure the required supplies of fuel and feedstock and takes the position that any risks that these arrangements might not be made are properly those of the permittee. As the applicant has not yet secured a supply of ethane sufficient to meet its total requirements, the Board would condition any permit issued respecting this application, requiring that AGEC satisfy the Board, prior to plant start-up, with respect to the arrangements for ethane supplies.

5.3 Efficient Use of Energy Resources

AGEC stated that current technology in respect of energy conservation and product yield efficiency would be incorporated in the plant design and estimated the overall plant energy recovery to be 76.5 per cent.

The Board is satisfied that AGEC's proposed process represents up-to-date technology and would be an efficient use of energy resources.

6 ENVIRONMENTAL AND SOCIAL IMPACT

6.1 Views of AGEC

AGEC submitted an environmental impact report which addressed the currently-approved Units 1 and 2, the applied-for Unit 3, and the polyethylene unit proposed by NOVA/Shell which is the subject of a separate application.

TABLE 3-1 BOARD ESTIMATE OF ALBERTA ETHANE SUPPLY-DEMAND[a]
m^3/d

YEAR	FROM GAS	FROM SYNTHETIC CRUDE OIL	TOTAL POTENTIAL SUPPLY	TOTAL DEMAND	SURPLUS (DEFICIT)
1981	13 330	-	13 330	14 150	(820)
1982	13 690	-	13 690	14 290	(600)
1983	13 720	-	13 720	14 560	(840)
1984	21 610	870	22 480	18 780	3 700
1985	29 330	1 740	31 070	24 330	6 740
1986	29 320	1 740	31 060	29 600	1 460
1987	29 260	2 460	31 720	29 040	2 680
1988	28 660	3 420	32 080	28 160	3 920
1989	27 720	4 320	32 040	26 540	5 500
1990	26 820	4 860	31 680	25 490	6 190
1991	26 370	5 340	31 710	25 170	6 540
1992	25 800	5 820	31 620	23 820	7 800
1993	25 140	6 300	31 440	23 160	8 280
1994	24 490	6 780	31 270	22 450	8 820
1995	23 760	7 260	31 020	22 340	8 680
1996	23 450	7 740	31 190	22 340	8 850
1997	23 590	8 220	31 810	22 120	9 690
1998	23 870	8 700	32 570	22 060	10 510
1999	24 460	9 180	33 640	22 060	11 580
2000	23 780	9 660	33 440	21 530	11 910
2001	23 140	10 140	33 280	21 530	11 750
2002	22 140	10 620	32 760	21 530	11 230
2003	21 150	11 100	32 250	21 530	10 720
2004	20 320	11 580	31 900	21 530	10 370
2005	19 920	12 060	31 980	21 530	10 450

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[a] Details of the Board's ethane supply-demand forecast are provided in Appendix B of this report.

With respect to *air quality*, AGEC submitted that emissions would be minimal and predicted maximum ground-level concentrations would on average be well below the maximum permitted in Alberta. The principal air contaminant from the ethylene units would be oxides of nitrogen (NO_x). Since the maximum ground-level concentration of NO_x permitted in Alberta might be approached under certain atmospheric conditions, AGEC stated that it would incorporate up-to-date burner and other technology in its design of all new cracking furnaces to minimize NO_x formation, review test data on existing stacks to ensure that existing emission concentrations do not increase, and conduct monitoring and stack tests to determine actual NO_x levels. Previous hydrocarbon emissions that resulted in odour problems have been identified as accidental or non-routine, and contingency plans have been implemented to deal with these types of problems should they occur in future. Fog generated by cooling towers would not result in traffic problems on nearby roads.

With respect to *water requirements and aqueous emissions* of the plant, AGEC stated that neither water withdrawal nor water discharge would result in a significant adverse impact on the Red Deer River. Water requirements would be taken from the Red Deer River and increase to about 3.5 times current levels should the entire development including three ethylene plants and a proposed polyethylene plant be placed in operation. AGEC would review the need for modifications to the effluent discharge structure to achieve mixing downstream of the effluent outfall. Effluent quantity and quality monitoring would continue.

With respect to *noise*, AGEC's objectives include maintenance or reduction of current noise levels throughout all phases of the planned development. Noise impacts generated from start-up operations would be reduced by using centrally-located vent silencers and venting scheduling. Methods to reduce the need for steam blowing of lines are to be investigated. For the existing ethylene plant, steam vent noise has been alleviated through the use of silencers, and flare noise would be reduced by a new flare-tip design and reduced flaring frequency.

With respect to *land use*, AGEC stated that no re-zoning was required for the proposed site and that the 80-acre plant site was proposed to be located in an area with soil consisting of 48 acres of Class 2 and 32 acres of Class 4 under the Canada Land Inventory classification system. Topsoil would be stripped from the proposed site and used to upgrade certain areas designated in the development agreement with the County of Lacombe. Stripping and replacing of topsoil would be done to the requirements established with the County and the district agriculturist.

Respecting *employment*, AGEC stated that construction employment benefits would be dispersed throughout the province with most construction workers being hired through unions in the Edmonton and Calgary regions which are major labour-recruiting centres. AGEC believed, however, that local benefits would be greater for the planned development construction phase than was the case with construction of Unit 1 because some unions had established hiring halls in Red Deer. Between 50 and 100 workers were expected to reside in the local area during construction. Local labour shortages might affect local business, including farm operations in the Red Deer region which may encounter difficulties in obtaining labour at acceptable wage levels.

Respecting *community impact*, the location of construction workers in on-site camps, and the purchase of most materials and services outside the region would minimize impacts of the construction phase on local communities. A construction camp would eliminate the need for most workers to travel to the site daily although traffic on main roads would increase on weekends when workers would return home or travel to nearby communities. Although recreation facilities would be provided at the camp, workers would visit the communities and increase the demand on local recreation and entertainment facilities.

AGEC expected that 90 new operating staff would be required for Unit 3, and about 35 per cent would be from the local area. AGEC anticipates that the population in the area would increase permanently during the operating phase. It stated that if vacancy rates were low when migration to the region increased, incoming people would find it more difficult to obtain housing. No adverse effects on community utilities and services would be likely, provided that increased funding and manpower were made available as required.

Respecting *traffic*, construction of Unit 3 would result in some 50 rail loads of equipment being delivered to the site. Secondary Highway 911, which extends east of Red Deer, is being upgraded to primary road status to accommodate traffic from Red Deer to industrial and resource developments in the area.

6.2 Views of the Interveners

Interveners expressed concerns about air and water emissions, noise, traffic, employment, and land use.

PAL stated that its primary concern was the type of land being used for industrial purposes and that industry other than agriculture should use poorer quality land for industrial development. PAL estimated that some 135 000 acres (54 600 hectares) of land having CLI classification ranging from 1 to 4 has been taken out of production for industrial plants in Alberta and were permanently lost for food production. This area does not include the amount of good land used for housing and the infrastructure that accompanies urban development. PAL estimated that for every 150 people employed at a plant, 160 acres (65 hectares) would be used for urbanization in the immediate vicinity, not including the additional land used for upgrading of roads, and for power lines and pipelines. PAL stated that AGEC's proposed plant has triggered other derivative industries wanting to establish in the area, and that this would take more good crop land out of production.

PAL also stated that a further major concern was degradation of roads in the area. During construction of Unit 1, roads were broken up because they could not withstand the tremendous traffic and the weight of the loads, and this was a very great inconvenience to the farming community in the area.

With respect to the *proposed site* for Unit 3, PAL noted that it was planned for the same site as Units 1 and 2 and that it made reasonable economic sense for it to be there. PAL indicated that if the proposed project were to proceed, the expansion should be controlled so that it would not cause cumulative adverse build-up of air and water pollutants.

The Commission stated that it did not oppose the location of Unit 3 and that it was satisfied the location was a good one. However, it stated that all means possible should be taken to minimize the loss of good arable land, either by choosing a site having poor soils or by mitigating measures when a site with some good soils must be chosen. The Commission recognized that the proposed plant would require a considerable area of good arable land. With respect to topsoil stripping, stockpiling, and reclamation, the Commission stated that the effect and success of the County's requirements and any activities in that respect should be documented by the industry. It stated that, in addition to the direct loss of agricultural lands, industrial development also causes ripple effects, such as higher land prices and uncertainty of farmers to continue to invest in the improvement of nearby and adjacent farms. With respect to the buffer area, the Commission stated that, while a buffer may help AGEC eliminate non-compatible uses from the fringes of the plant, it may also be readily looked upon as lands available for industrial development since they are not owned by farmers. The Commission was of the view that the buffer should be maintained.

The Commission stated that there could be social costs associated with an expected increase in population as a result of AGEC's proposed project. These include local labour shortages during both construction and operations phases, and social problems such as increased crime, increased policing demands, traffic, a general inflationary upswing, and the need for improvements to municipal infrastructures. There may be many more results of a social impact nature which are yet unknown.

6.3 Views of the Board

With respect to the matters of *air quality*, *water quality* and *plant water requirements*, and *noise*, the Board is satisfied that adherence to all requirements of the Board and Alberta Environment would limit the impact to a minimal and acceptable level.

Respecting the impact on current and future *land uses* in an area of a proposed industrial project, the Board believes that the suitability of each proposed location must be judged on its own merits. The Board notes that the proposed plant addition would adjoin the existing ethylene plant complex and would be located within the site now zoned for industrial purposes by the County of Lacombe. The Board agrees with the applicant that the total land requirements for the proposed plant and related facilities can be minimized through expansion at the existing plant site.

On the matter of land use zoning, the Board supports the position of PAL, the Commission, and others, that soils having good agricultural capacity generally should not be allocated for industrial or urban development. The Board believes on balance, that the amount of good quality agricultural land affected by the particular plant is modest in relation to the public benefit that would be obtained, and therefore considers the location selection acceptable.

The Board notes that there was some discussion at the hearing respecting the desirability of a buffer zone around the industrial plant development. The Board subscribes to the concept of a buffer zone but believes that it should be intended for the life of the plant and should not simply be additional area into which the industrial development may expand.

With respect to *social impact* matters, the Board believes that a project of this magnitude would likely result in some short-term problems during the peak construction phase, particularly in the area of public protection. Relative to the region, it expects these would not be significant. The Board is satisfied that population growth related to the operating stage could be reasonably accommodated by the gradual expansion of housing, recreation facilities, transportation, law enforcement, and social services already available in the area.

7 MARKETING AND UPGRADING POTENTIAL

7.1 Ethylene Demand

7.1.1 Views of AGEC

AGEC forecast the demand for ethylene in Canada to increase from 1215 kt in 1980 to 3190 kt by 1990, yielding a compounded growth rate of about 11 per cent per annum. With this demand forecast, AGEC estimated that current and planned ethylene capacity, including the current applied for plant, would result in a shortfall of some 300 kt by 1990.

The applicant's ethylene price forecast was based on a cost of service formula including a rate of return on equity. Further, ethylene prices would represent the weighted-average cost of production from AGEC's three plants. Thus, prices were expected to increase from a low of $600/t in 1985 to a high of $1960/t by 1994, yielding a maximum average annual increase of about 6.5 per cent.

The applicant noted that preliminary contract negotiations were taking place with several parties requiring ethylene. It was suggested that there were many projects being planned which would involve the further upgrading of ethylene within Alberta.

7.1.2 Views of the Board

The Board agrees that there should be ample demand for the output of the proposed plant. The Board also agrees with AGEC that there are several potential users of ethylene in Alberta, and anticipates that further upgrading could take place. The Board notes that Order-in-Council 213/81 established that all ethylene supply contracts respecting the output from Unit 2 require the approval of the Minister of Economic Development.

8 ECONOMIC IMPACT

8.1 Views of AGEC

The Alberta component of total capital expenditures for the proposed ethylene facility was given by the applicant as $591 million in current (as spent) dollars. In its calculation of operating expenditure impacts, the applicant excluded feedstock costs and local taxes, and included all of the proposed project's net cash flow. The sum of the operating expenditures in Alberta was given as $4284 million in current dollars over the life of the proposed project. Summing the capital and operating impacts, and applying an income/expenditure multiplier of 1.8, the applicant stated that the total direct and indirect impacts would be in the order of $8800 million in current dollars over the life of the project.

The applicant provided a net benefit evaluation of the proposed ethylene/incremental ethane projects wherein provincial income taxes, local taxes, and all of the net cash flow were considered to be the net benefits accruing to the Alberta economy. The present discounted value of the net benefits in 1980 constant dollars was calculated to be $93 million.

Construction of the ethylene/incremental ethane projects would require approximately 2270 man-years of labour and supervisory personnel. The applicant stated that 93 permanent positions would be filled during the operations phase, and using an employment multiplier of 4.22, a total of 392 direct and induced jobs would be added to the Alberta economy. At the hearing, the applicant indicated that job creation did not necessarily confer employment benefits on the province as Alberta's labour force is already near full employment. Thus, a new project would result in shifts within the current labour market as well as increased migration to Alberta from other parts of Canada.

8.2 Views of the Board

In its assessment of economic impacts, the Board considered the capital and operating costs of the proposed ethylene facility, and excluded the ethane extraction facilities.

The applicant indicated that 70 per cent of the combined capital costs of the ethylene/incremental ethane project would be made in Alberta. Assuming this figure applies to the ethylene project itself, and adjusting for working capital, capital expenditures in Alberta would have an approximate value of $300 million in 1980 dollars.

For purposes of this analysis, the Board defined income-related impacts as Alberta's share of capital and operating costs, provincial corporate income taxes, municipal taxes, and that portion of net cash flow owned by Albertans through equity participation in the proposed project.

From the applicant's evidence, it appears that about 85 per cent of the operating expenditures for the ethylene plant would be made in Alberta. Thus in 1986, year 2 of the operating phase, some $22 million (current dollars) would represent the Alberta component of operating expenditures. Assuming a 9 per cent rate of inflation, this would equate to about $14 million (1980 constant dollars). As this will be a recurring expenditure over 19 years, the total impact would be some $272 million (1980 constant dollars). Adding the expenditures from the first year of operation would bring this total to about $294 million and setting out municipal taxes would reduce this to about $254 million (1980 constant dollars).

The economic impact in Alberta from the project's capital and operating expenditures would be about $554 million (1980 constant dollars). These impacts are to be understood in a "gross" rather than a "net" sense, since many of the inputs, particularly labour, could be employed elsewhere in the Alberta economy. As distinct from the above "impacts", Alberta's share of net cash flow, corporate income tax, and municipal taxes could legitimately be counted as both impacts and net benefits, assuming that no public expenditures would be required to accommodate the project.

In its evaluation of the Alberta benefits from a project's net cash flow, the Board considers only that portion of net cash flow accruing to Alberta equity participants. Therefore, applying a provincial equity participation rate of 20 per cent, and assuming a 9 per cent rate of inflation, the net cash flow accruing to Alberta from the proposed project would be in the order of $48 million (1980 constant dollars).

Assuming an inflation rate of 9 per cent, the value of provincial corporate income taxes would be about $20 million (1980 constant dollars) over the life of the project. Municipal taxes were estimated to be about $40 million (1980 constant dollars).

The total economic impact of the project in Alberta would therefore be approximately $662 million (1980 constant dollars). Using an income/expenditure multiplier of 2.0, the project would ultimately generate gross expenditures and incomes in the order of $1324 million (1980 constant dollars).

The table below presents this data in two components:

1 those expenditures which are resource-using, and
2 those items which are considered to be net provincial benefits in that they do not use resources.

ECONOMIC IMPACT ON ALBERTA
(millions 1980 constant dollars)

1 Resource-Using Expenditures		
Capital		300
Operating Costs		254
	Subtotal	554
2 Net Benefits		
Provincial Income Tax		20
Municipal Tax		40
Net Income Accruing in Alberta		48
	Subtotal	108
TOTAL		662

The Board believes that the applicant's estimates of manpower requirements for construction and operating personnel are reasonable. The Board encountered some difficulty, however, with the applicant's treatment of the employment multiplier.

The applicant suggested an income multiplier of 1.8, based on a study by Foster Research Ltd. Then the applicant stated that, "Assuming the average project wage is 25 per cent higher than the average wage in the province as a whole, a Keynesian employment multiplier of 2.0 results".

It is not clear to the Board why this necessarily results. Neither is it clear why, "indirect employment is estimated by assessing the labour component of non-wage expenditures", or why one requires an assumption about the average wage of indirect jobs created.

Following is a summary of the Board's views on employment generation. The Board's primary purpose, in this area, is to anticipate manpower requirements and population changes that could result from a new economic activity. Generally, the Board regards the employment multiplier as a valid theoretical concept which helps to describe these ultimate changes.

Manpower requirements are not only a function of the number of people employed on a given project, but also depend on the total provincial expenditures generated by a project. For example, additional payments to Alberta insurance companies, as one of the project's normal operating expenses, can generate additional employment within the economy, regardless of how many people are employed by the project. The problem, then, is to evaluate the relationship between project expenditures within the province and future additional manpower requirements.

One approach is to assess the recurring expenditures that could occur on an annual basis, and relate that to annual costs of employing additional people. The recurring annual expenditures for this project are likely to be operating costs and taxes. Assuming that governments spend their revenues, and assuming an income/expenditure multiplier of 2.0 is appropriate, the ultimate annual expenditures generated from this project would be about $31 million (1980 constant dollars) per annum, which includes operating costs and provincial and municipal taxes. Thus, it is suggested that $31 million (1980 constant dollars) would finance the employment generated by the project. At this point one needs to determine the additional costs that would typically be incurred by hiring additional employees in the economy. For example, the applicant's cost estimate for 1986 was given as about $264 million (current dollars), excluding feedstock costs. With a 9.0 per cent inflation rate, the $264 million would equate to about $157 million in 1980 constant dollars. With a staff complement of 93 people, this works out to be an expenditure of about $1.7 million (1980 constant dollars) per employee per annum. If this were an average expenditure per employee for all sectors, the project's annual incremental expenditure of $31 million (1980 constant dollars) could finance, at most, about 18 jobs.

It is believed not likely that a typical industry would spend in the order of $1.7 million per annum per employee. If, for the sake of discussion, the typical expenditure was only $100 thousand per annum per employee (based on a cursory review of several corporate and government publications), the recurring annual expenditures from this project, $31.4 million (1980 constant dollars), could finance, at most, some 310 jobs. Since 93 of these jobs are project related, induced employment would then be a maximum of some 217 jobs.

This discussion is, by no means, intended as a final estimate of the indirect employment which would result from the proposed project. The Board merely wishes to describe one manner of establishing a relationship between the project's expenditures and induced employment impacts on the economy. According to the above methodology, induced employment is independent of the number of direct project employees and their relative income levels. Rather, the emphasis here is on the project's annual income/expenditure impacts within Alberta, and the total costs of providing an additional job within Alberta. If the average expenditure per job can be estimated with reasonable accuracy, the annual income/expenditure impact will define the maximum number of additional jobs that can be generated in Alberta.

In summary, the Board agrees with the applicant that the proposed project would have a substantial positive economic impact on the province and that it would result in significant employment opportunities.

9 DECISION

Having regard for its findings and responsibilities under the Act, the Board is prepared, with the approval of the Lieutenant Governor in Council, to grant the applied for industrial development permit to The Alberta Gas Ethylene Company Ltd. The permit would be in the form shown in Appendix C, and subject to all of the terms and conditions contained therein and to any terms and conditions imposed by the Lieutenant Governor in Council.

ISSUED at Calgary, Alberta on 26 June 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy
G. J. DeSorcy, P.Eng.
Vice Chairman

N Strom
N. Strom, P.Eng.
Board Member

HJ Webber
H. J. Webber, P.Eng.
Acting Board Member

H M Douglas
H. M. Douglas, P.Ag.
Acting Board Member

APPENDIX A

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
The Alberta Gas Ethylene Company Ltd. (AGEC) F. R. Foran E. M. Bredin, Q.C.	Dr. J. Sutherland, P.Eng. R. Bowser, P.Eng. B. Clark, P.Eng. B. Fraser, P.Eng. Dr. W. Langford E. Berlie, P.Eng. T. Reuvers D. Boyd, P.Eng.
Preserve Agricultural Land (PAL) F. E. Mueller	F. E. Mueller
Red Deer Regional Planning Commission (Commission) L. C. Currie	L. C. Currie, MCIP W. G. A. Shaw, MCIP
Bruce W. Hainsworth B. W. Hainsworth	
Dean Chessor Dean Chessor	
Alberta Energy Company Ltd. and Esso Chemical Canada (AEC/Esso) D. G. Hart	
Alberta Energy Company Ltd. and Du Pont Canada Inc. (AEC/Du Pont) D. G. Hart	
Celanese Canada Inc. (Celanese) J. I. Parker	
Dow Chemical of Canada, Limited (Dow) A. L. McLarty	
Esso Chemical Canada (Esso) W. Hartnett	

THOSE WHO APPEARED AT THE HEARING cont'd

Principals and Representatives (Abbreviations used in Report)	Witnesses
NOVA, AN ALBERTA CORPORATION and Shell Canada Limited (NOVA/Shell) F. R. Foran	
Union Carbide Canada Limited (Union Carbide) J. W. Beames	
Dome Petroleum Limited (Dome) J. Caffrey	
Esso Resources Canada Limited (Esso Resources) J. Lowman	
Gulf Canada Resources Inc. (Gulf) J. Anderson	
Hudson's Bay Oil and Gas Company Limited (HBOG) R. N. Perrin	
Sulpetro Limited (Sulpetro) R. Harrop	
Texaco Canada Resources Ltd. (Texaco) W. Muscoby	
Alberta Environment staff K. Smith S. Lupul, P.Eng.	
Energy Resources Conservation Board staff K. Miller J. D. Dilay, P.Eng. P. Raina K. Johnston	

Submissions were also received from the following who did not appear at the hearing:

Town of Stettler
Federation of Alberta Naturalists
Stettler and District Economic Development Board

APPENDIX B DETAILS OF THE BOARD'S ETHANE FORECAST

1 ETHANE FROM GAS

The Board has made a forecast of expected gas production having regard for the Alberta gas supply protection formulae, the Board's estimate of Alberta's ultimate potential for gas and the potential productive capacity of established and future reserves. Also considered were expected Alberta and Canadian gas markets, existing export licences, and nominal provisions for new export licences which could be granted under the current National Energy Board gas supply protection formulae.

1.1 Gas Serving Alberta Requirements

The Board believes that additional volumes of ethane may be recovered from gas serving Alberta's future requirements in addition to the ethane that will be recovered at the existing Dome-CUE plant. The Board estimates that 50 per cent of the remaining gas not processed at this plant could be processed for additional ethane removal. It has estimated that the gas would contain 0.05 mole/mole ethane of which 50 per cent could be recovered. This forecast is shown in Table B-1.

1.2 Gas Serving Ex-Alberta Requirements

While some gas is removed from Alberta through facilities where gas throughput volumes are insufficient to make ethane recovery viable, the Board believes that most of the gas serving ex-Alberta requirements would be reprocessed for the recovery of ethane. The Board has assumed that existing extraction plants will operate at capacity to the extent that gas supplies are available. Listed below are the ethane recovery efficiencies and inlet-gas ethane contents used in forecasting ethane available from existing extraction plants.

PLANT	INLET GAS ETHANE CONTENT mole/mole	RECOVERY FACTOR per cent
Empress-Petro-Canada	0.04	55
Empress-Dome	0.04	44
Cochrane-ANG	0.075	55
Waterton-Shell	0.05	60

The Board believes that some of the existing reprocessing plants could be modified by installation of deeper-cut facilities to improve the ethane recovery efficiency. For this assessment, the Board has estimated that the recovery efficiencies would be improved to 75 per cent at the two Empress plants and 85 per cent at the Cochrane plant.

The Board also believes that existing plants could be expanded or that new ethane recovery facilities could be constructed to process gas which is in excess of the existing plant capacities. The inlet gas capacity for such expanded or new facilities was determined having regard for the Board's expected gas production forecast, the volumes which would be available to such facilities, and an operating life which would make the facility economically viable. The forecast of ethane potentially available from new or expanded facilities was based on a reprocessing plant efficiency of 80 per cent and a 0.04 mole/mole ethane content in the gas stream.

The Board's forecast of ethane recoverable from gas serving ex-Alberta requirements in shown in Table B-1.

2 ETHANE FROM SYNTHETIC CRUDE OIL

The Board has estimated an ethane/ethylene yield of 78 cubic metres from the production and processing of one thousand cubic metres of synthetic crude oil. Applying an 80 per cent recovery factor to this value yields a recovery ratio of 60 m^3 of a C_2 mix per 10^3 m^3 of synthetic crude oil.

To obtain its forecast of ethane recoverable from synthetic crude oil production, the Board combined this recovery ratio and its most recent forecast of synthetic crude oil production contained in Table 4-14 of ERCB Report 81-B. The Board's forecast of ethane recoverable from the production of synthetic crude oil is shown in Table B-2. Due to the uncertainties associated with estimating increases in synthetic crude oil production, the Board believes that its forecast of ethane supplies recoverable from this source should be used with caution.

3 COMPARISON OF FORECASTS

Tables B-1, B-2, and B-3 present the Board's and AGEC's forecasts of ethane recoverable from the processing of gas and synthetic crude oil, and total ethane supply.

4 OTHER POTENTIAL ETHANE SOURCES

The Board has not prepared forecasts of ethane recoverable from conventional crude oil refineries or recoverable from ethane injected or to be injected in miscible-flood schemes. The Board believes that, while refineries and miscible-flood banks represent potential ethane supplies, their contribution to total ethane availability would be small relative to the other sources identified.

TABLE B-1 FORECASTS OF POTENTIAL ETHANE SUPPLIES FROM GAS
m^3/d[a]

ear	Board Forecast From Gas Serving Alta. Requirements	Board Forecast From Gas Serving Ex-Alta. Requirements	Board Forecast Total Ethane From Gas	AGEC Forecast Total Ethane From Gas
981	1 990	11 340	13 330	13 500
982	2 340	11 350	13 690	13 980
983	2 380	11 340	13 720	17 110
984	3 320	18 290	21 610	20 100
985	4 240	25 090	29 330	24 150
986	4 330	24 990	29 320	27 360
987	4 360	24 900	29 260	27 700
988	4 330	24 330	28 660	27 980
989	4 300	23 420	27 720	27 980
990	4 300	22 520	26 820	28 120
991	4 190	22 180	26 370	27 610
992	4 190	21 610	25 800	27 110
993	4 210	20 930	25 140	26 860
994	4 240	20 250	24 490	26 380
995	4 300	19 460	23 760	26 190
996	4 330	19 120	23 450	26 020
997	4 360	19 230	23 590	25 800
998	4 400	19 470	23 870	25 630
999	4 430	20 030	24 460	25 490
000	4 440	19 340	23 780	25 270
001	4 480	18 660	23 140	25 130
002	4 500	17 640	22 140	24 880
003	4 540	16 610	21 150	24 710
004	4 570	15 750	20 320	24 460
005	4 590	15 330	19 920	23 030

Based on 100 per cent ethane.

TABLE B-2 FORECASTS OF POTENTIAL ETHANE SUPPLIES FROM SYNTHETIC CRUDE OIL
m^3/d[a]

Year	Board Forecast	AGEC Forecast
1981	-	-
1982	-	-
1983	-	-
1984	870	510
1985	1 740	1 300
1986	1 740	1 390
1987	2 460	2 050
1988	3 420	3 030
1989	4 320	3 480
1990	4 860	3 600
1991	5 340	3 920
1992	5 820	4 330
1993	6 300	4 330
1994	6 780	4 420
1995	7 260	4 740
1996	7 740	5 150
1997	8 220	5 150
1998	8 700	5 240
1999	9 180	5 590
2000	9 660	6 000
2001	10 140	6 000
2002	10 620	6 000
2003	11 100	6 000
2004	11 580	6 000
2005	12 060	6 000

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[a] Based on 100 per cent ethane.

TABLE B-3 FORECASTS OF TOTAL POTENTIAL ETHANE SUPPLY m^3/d[a]

Year	Board	AGEC[b]
1981	13 330	13 500
1982	13 690	13 980
1983	13 720	17 110
1984	22 480	21 130
1985	31 070	25 990
1986	31 060	29 290
1987	31 720	30 300
1988	32 080	31 560
1989	32 040	32 000
1990	31 680	32 250
1991	31 710	32 090
1992	31 620	31 970
1993	31 440	31 720
1994	31 270	31 360
1995	31 020	31 470
1996	31 190	31 720
1997	31 810	31 500
1998	32 570	31 420
1999	33 640	31 640
2000	33 440	31 810
2001	33 280	31 670
2002	32 760	31 420
2003	32 250	31 250
2004	31 900	31 000
2005	31 980	29 570

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[a] Based on 100 per cent ethane.

[b] Includes C_2 available from existing Edmonton refineries.

81 07 02
Disk-1

APPENDIX C FORM OF PERMIT

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit to The Alberta Gas Ethylene Company Ltd. authorizing the use within Alberta of ethane and gas produced in Alberta in the production of ethylene

INDUSTRIAL DEVELOPMENT PERMIT NO. AGE 81-1

WHEREAS The Alberta Gas Ethylene Company Ltd. has applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42 of The Oil and Gas Conservation Act, authorizing the use of ethane and gas produced in Alberta for the production of ethylene in Alberta; and

WHEREAS the Board, upon inquiry into the application, is of the opinion that the granting of this industrial development permit for the use of ethane and gas in the production of ethylene is in the public interest having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council, by Order in Council, numbered O.C. and dated has authorized the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to The Alberta Gas Ethylene Company Ltd. (hereinafter called "the Permittee") authorizing the use of ethane as a raw material and gas as a fuel in the production of ethylene, subject to the regulations and orders made pursuant to the said Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use by the Permittee of ethane as raw material and gas as fuel in the production of approximately 748 000 tonnes per year of ethylene, generally as described in the application dated October 27, 1980.

2. The ethane as raw material and gas as fuel authorized by clause 1 is for use in an ethylene plant located in Sections 29, 31 and 32, all in Township 38, Range 25, West of the 4th Meridian.

3. Subject to the conformity by the Permittee with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on December 31, 2005.

4. The quantity of energy resources that may be used in the facilities referred to herein in the production of ethylene shall not exceed 2 773 000 cubic metres of ethane per calendar year as raw material nor 562 000 000 cubic metres of gas per calendar year as fuel.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37 400 00 joules per cubic metre, and the quantities of ethane shall be on the basis of ethane in the liquid phase at equilibrium pressure and 15 degrees Celsius.

6. All ethane and gas used in producing ethylene pursuant to this permit shall be measured by or on behalf of the Permittee in a manner satisfactory to the Board, and the volumes of ethane used as raw material, gas used as fuel and ethylene produced shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittee shall obtain the approval of the Board of any major changes in design of the plant facilities.

8. (1) The Permittee shall satisfy the Board prior to January 1, 1985, as to the arrangements that have been made for the supply of energy resources for the operation of its third ethylene plant, unless upon application by the Permittee a later date is stipulated by the Board.

(2) The Permittee shall satisfy the Board by January 1, 1982, that construction of its proposed project has commenced or will commence before July 1, 1982, and that construction of the proposed facilities will continue in accordance with a schedule approved by the Board, unless upon application by the Permittee later dates are stipulated by the Board.

(3) During the construction of the proposed project the Permittee shall inform the Board, on a semi-annual basis, of the progress of construction.

9. The Permittee shall satisfy the Board prior to January 1, 1985, respecting the volume of gas to be used as fuel in the plant, and respecting the disposition of the off-gas and liquid by-product streams, unless upon application by the Permittee a later date is stipulated by the Board.

10. The Permittee shall operate the facilities in a manner that results in

(a) the maximum practicably obtainable efficiency in the use of ethane and gas for the manufacture of ethylene, and

(b) the maximum practical conservation of ethane and gas.

11. The Permittee shall not

(a) assign this permit, or

(b) release from its control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

12. (1) Attached hereto as Appendix A and made part of this permit is the order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the order of the Lieutenant Governor in Council set out in Appendix A.

13. Where it appears to the Board or the Lieutenant Governor in Council that the Permittee has contravened or failed to comply with any term or condition contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and with the approval of the Lieutenant Governor in Council may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

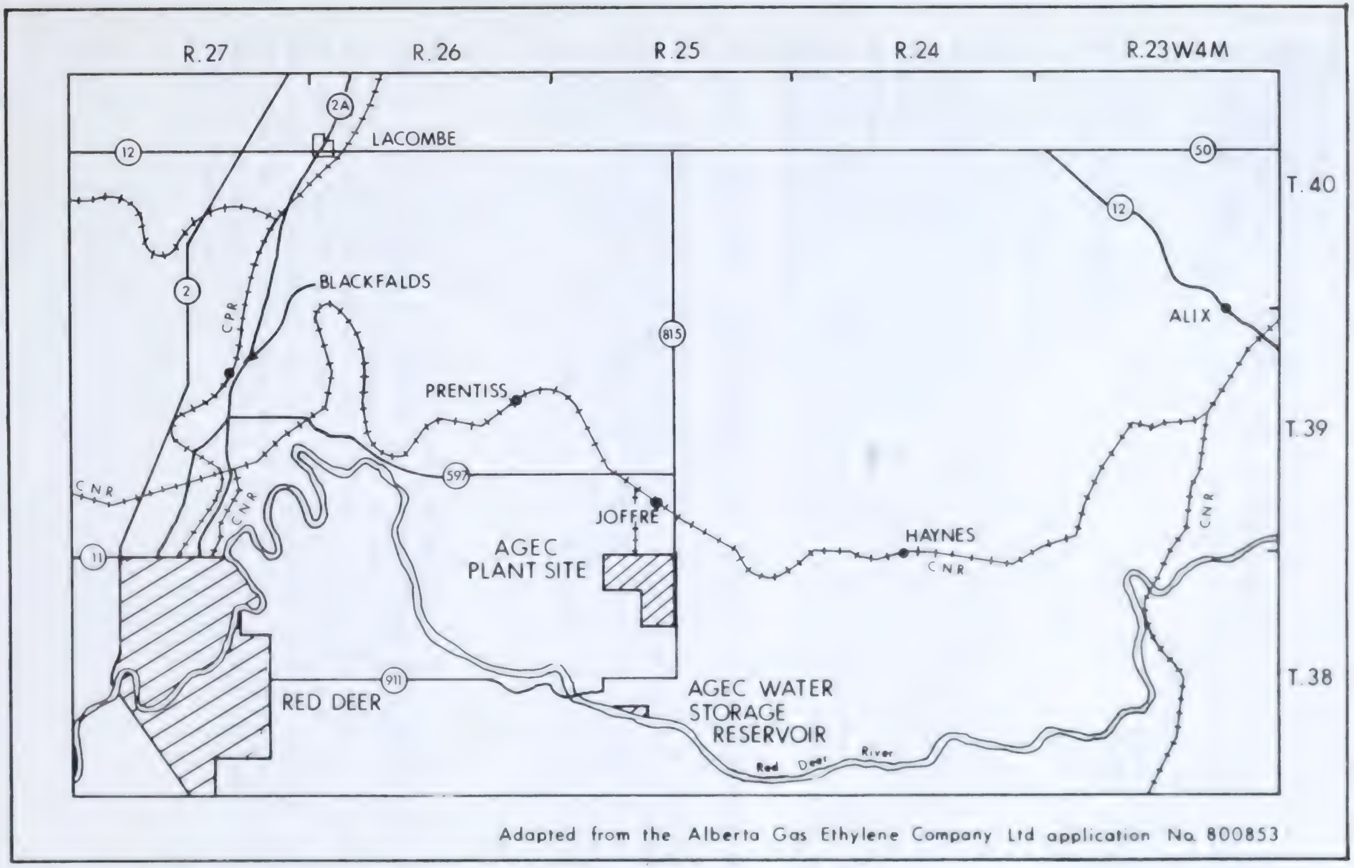
(b) the Lieutenant Governor in Council may amend, vary, add to or replace any terms or conditions contained in this permit.

14. Notwithstanding the provisions hereof, the Permittee shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of energy resources within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

Vernon Millard
Chairman



Adapted from the Alberta Gas Ethylene Company Ltd application No. 800853

APPENDIX D LOCATION OF THE JOFFRE PLANT SITE

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

APPLICATION BY
WESTERN DECALTA PETROLEUM (1977) LIMITED
TO REINSTATE WELL LICENCE NOS. 85532 and 85632 Decision Report 81-11
ROCKYFORD AREA Application 800934

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1 INTRODUCTION

1.1 The Application

Licences for the wells, Decalta et al Rockyford 6-25-26-23 and Decalta et al Rockyford 6-26-26-23, were issued on 10 September 1980 and 15 September 1980, respectively, and subsequently suspended when it became evident to the Energy Resources Conservation Board (Board) that the applicant had not reached an agreement with the surface owners with respect to the location of the wells. On 19 November 1980, Western Decalta Petroleum (1977) Limited applied to the Board to have the licences reinstated.

Figure 1 indicates the proposed well sites and surrounding area.

The surface owners of the lands in question, Mr. R. F. Kenworthy (the 6-26 well) and Kettenbach Farms Ltd. (the 6-25 well) filed objections to the application. Other parties who filed an objection to the application and appeared at the hearing, as well as those who filed an objection and did not appear at the hearing, are listed in this report.

1.2 The Hearing

On 14 January 1981, at Rockyford, Alberta, a public hearing of the application commenced before the Energy Resources Conservation Board with G. J. DeSorcy, P.Eng., V. E. Bohme, P.Eng., and J. A. Bray, P.Eng. sitting. As part of the proceedings, the Board and interested parties to the hearing visited the two proposed well sites. At the request of the local interveners, Mr. R. F. Kenworthy and Kettenbach Farms Ltd., the hearing was adjourned, to allow the interveners reasonable time to prepare an environmental study. The hearing reconvened on 26 February 1981 at Rockyford.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Western Decalta Petroleum (1977) Limited (Western Decalta) P. R. Murray	R. F. Calow, P.Geol. M. N. Young, P.Eng. J. A. McTavish L. A. Shier, P.Eng. B. Martens (B.Sc.Biol) J. A. Smith (M.Sc.Biol)
Kettenbach Farms and R. F. Kenworthy (Local Interveners) P. J. Madden	M. N. Kettenbach F. W. Kettenbach R. F. Kenworthy J. A. Campbell S. Posey O. Christensen D. Watson J. C. Cammaert M. E. Kenworthy G. C. D. Griffiths, Ph.D L. J. Katterhagen
Alberta Energy and Natural Resources, Fish and Wildlife Division (Fish and Wildlife) E. H. Bruns	E. H. Bruns
Energy Resources Conservation Board (Board staff) D. A. Holgate D. L. Skappak	

Interventions were received from the following parties who did not present their briefs at the hearing:

R. L. Comstock
County of Wheatland
D. W. Settles
S. Saunby
R. Barr and S. Barr
M. A. Biggs
L. Erickson

In addition, J. W. Miller presented an oral submission at the hearing, but did not file a written submission prior to the proceedings.

2 RIGHT OF WESTERN DECALTA TO DRILL AND NEED FOR WELLS IN THE GENERAL AREA

2.1 The Applicant's Views

The applicant advised that by way of a farm-in agreement with PanCanadian it has the right to explore for minerals on the subject properties. A well is required in section 25 to earn an interest in this section. The pool is in its very early stages of development and additional wells are required to delineate the pool and to prove up additional reserves.

2.2 THE INTERVENERS' VIEWS

The local interveners did not dispute Western Decalta's right to drill wells in sections 25 and 26, however, they suggested that surface locations could be selected that would have less of an environmental impact on the area. In their opinion, other locations exist in the two sections that would present less risk to the operator and would be more favourable to the surface owners.

2.3 The Board's Views

The Board accepts that the applicant has the right to win the minerals under the lands in question. The Board agrees that wells are required in the general area proposed by Western Decalta to help delineate the pool, but not necessarily at the proposed locations. (This matter is dealt with further in subsequent parts of the report.)

3 APPROPRIATENESS OF SPECIFIC PROPOSED LOCATIONS FROM SUBSURFACE POINT OF VIEW

3.1 The Applicant's Views

Western Decalta stated that the well sites were selected having regard for its geological interpretations and spacing requirements of The Oil and Gas Conservation Act and Regulations (see Figure 2). The site selected in 6-25 is one which would allow the well to be drilled on target and with a good chance of being successful. The selected site should also assist in locating the eastern edge of the pool.

The site selected in 6-26 would also allow the well to be drilled on target with a good chance of being successful. In addition, a well on the proposed site should help locate the western edge of the pool.

Although other sites may provide equal or better chances of a successful well, it was the applicant's position that the wells should be drilled on target in Lsd 6. Drilling the wells on target, in addition to being the optimum locations with respect to pool delineation, would provide proper spacing for optimum pool drainage and possible enhanced recovery.

3.2 The Interveners' Views

The local interveners contended that there are other locations in sections 25 and 26 that could be selected as well sites that would provide an equal or better chance of success as the locations selected, by Western Decalta. They did not comment on the relationship of the locations respecting ultimate oil recovery from the pool.

3.3 The Board's Views

The Board notes Western Decalta's desire to drill the wells on target in accordance with current spacing requirements, however, since special drilling spacing units may be set up under the provisions of sections 4.030 and 4.060 of the Oil and Gas Conservation Regulations, the matter of drilling on target by itself is not critical.

The Board agrees that if Western Decalta's geological interpretation is correct, the proposed wells would help delineate the east and west edges of the Basal Quartz pool, however, such wells would be relatively high risk because they would be located near the postulated edges of the pool. An updip location such as 6-25 is important in establishing the location and size of the gas cap. There are a number of other possible locations along the northwest-southeast trend of the pool that would also assist with pool delineation.

The Board agrees that reasonably uniform spacing of wells is desirable to help recover the maximum amount of oil, particularly if enhanced recovery is instituted; however, there are many other factors affecting oil recovery and the well sites can be located with some flexibility. The Board notes that the structural position of the gas-oil interface is uncertain because of limited wellbore information. It appears to the Board that further knowledge of the reservoir would be greatly improved by a well near the proposed location of 6-25. This information would provide the basis for planning further development of the pool, should it be warranted.

Overall, from a subsurface point of view, the Board concludes that the locations selected by Western Decalta are reasonable but not so critical that alternatives do not exist.

4 ALTERNATIVES AVAILABLE FROM SUBSURFACE VIEWPOINT

4.1 The Applicant's Views

It was the applicant's position that wells drilled on any other locations would not provide adequate information for pool delineation. It contended that current spacing regulations provide for proper well spacing, which in turn assists ultimate recovery from the reservoir. Should enhanced recovery be initiated in the pool at some later date it would be important to have the wells more or less equally spaced.

4.2 The Interveners' Views

The interveners suggested that alternative locations are available for each of the proposed wells. In the case of the 6-25 well, it was suggested that, based on the isopach map submitted by the applicant, equally attractive locations exist in Lsd 12 and Lsd 13. Based on the same information, the interveners suggested the well in section 26 should be drilled from a location in 11-26. As mentioned previously, the interveners did not consider maximizing recovery from the pool.

4.3 The Board's Views

The Board has reviewed alternative locations suggested by the local interveners, taking into account their suitability in the development of the oil pool, and offers the following comments. The comments, reflect the postulated configuration of the pool put forward by Western Decalta at the hearing.

A) Alternative Locations to Lsd 6-25

(1) Lsd 11-25. A location in 11-25 would appear to be, from a geological point of view, about as attractive as a well in 6-25. Recognizing the uncertainty of the eastern limits of the pool, a well in 11-25 would probably assist in determining the eastern limits to the same degree as the proposed well. However, a well in 11-25 would not be as useful in determing the size of the gas cap as would a well in 6-25. A well in 11-25 would be off target, however, some flexibility does exist under current spacing regulations to vary target-area location and size. This possibility has not been addressed by the applicant. In the event that a line-drive waterflood were implemented in the future, the shifting of the 6-25 well downdip to 11-25 could prevent the flood from achieving its maximum advancement and thus reduce the ultimate recovery of oil from the pool.

(2) Lsd 12-25. A well in 12-25 would, from a geological point of view, be more attractive than a well in 6-25. Such a location would also assist in determining the eastern edge of the pool, although not as effectively as the proposed 6-25 well. The off-target location in 12-25 would not provide the same knowledge of the pool as the proposed well, and additionally, would encroach upon possible future locations closer to the centre of the pool.

(3) Lsd 13-25. A well in the southwest corner of this legal subdivision would represent a geological risk similar to the proposed well. The well would be off target and could present drainage problems because of its proximity to a potential on-target well in 16-26, should such location ultimately be drilled. A well located in 13-25 would provide no especially useful knowledge of the pool.

(4) Lsd 14-25. The presently perceived risk of drilling a dry hole makes this location unacceptable.

Other locations to the south of 6-25 were not considered because they would not be as desirable from a surface point of view.

The Board agrees with the applicant that the 6-25 location, as proposed, represents a location at least as reasonable as any other to delineate the pool. The location is also one that has a reasonable chance of success and would provide good hydrocarbon drainage of the pool. If the 6-25 well were drilled first, valuable knowledge of the reservoir parameters notably the extent of the gas cap, would be gained which could assist in planning future developments.

B) Alternate Locations to Lsd 6-26

(1) The Western Edge of Legal Subdivision (Lsd) 6. Based on the geological information presented, any significant movement of the proposed well in a westerly direction, ie away from the pool centre, would represent an unacceptable increase in the dry-hole risk.

(2) Lsd 11-26. A well in 11-26 would be more attractive than a well in 6-26 from a geological point of view. It would, however, place the well off target and approximately 250 metres nearer the 14-26 well. This would result in an "overlap" of the drainage radii of the two wells and reduce ultimate recovery. Under waterflood enhanced recovery the gap in the flood pattern due to the absence of a well in 6-26 could significantly reduce oil recovery.

(3) Southeast Quarter of Section 26. Locations in Lsds 1, 7, and 8 would be as desirable as a location in 6-26 from a pool delineation point of view and would represent more or less the same dry-hole risk. In addition, such locations could prove more beneficial in gas-cap delineation, depending on the results of 6-25. The oil and gas underlying section 23 is not owned by Western Decalta and the movement of the proposed well in southerly direction to an off-target location could be objected to by the respective mineral holder on the basis of well clustering and lease line drainage. However, if the pool underlies a significant part of section 23 or other lands not belonging to Western Decalta, a unit operating agreement could be negotiated with other mineral owners. This would remove target area problems as far as equity is concerned.

The Board is of the opinion that the 6-26 location selected by the applicant is one that provides the applicant with a reasonable chance of drilling a successful well. It is one of a number of locations that can be selected to help establish the edge of the pool. From a drainage and conservation point of view it is beneficial to drill the well in Lsd 6, thus avoiding an overlapping of the drainage radii or leaving unrecovered reserves between the 14-26 and 6-26 wells. However, important knowledge of the pool parameters, especially the extent of the gas cap, could be gained by drilling the 6-25 well first.

5 APPROPRIATENESS OF SPECIFIC LOCATIONS FROM SURFACE POINT OF VIEW

5.1 The Applicant's Views

According to Western Decalta, the proposed 6-25 well site and access road would remove 3.5 hectares of land from agricultural production. The access road would be located along existing fence lines to minimize the interference with agricultural operations. The well site itself would require that up to 3.5 m of dirt be cut from the north upslope half of the site and used as fill on the south side. Erosion was not considered by the applicant to be a problem at this site.

The well would be located above the valley bottom on cultivated land some 150 metres north of the CNR tracks. The valley bottom south of the railway tracks and north of Serviceberry Creek in the area of the 6-25 location is also cultivated.

The proposed well site and access road, for 6-26 would be located on uncultivated land and from an agricultural point of view, would only affect its grazing potential.

Western Decalta contracted Techman Engineering Ltd. of Calgary to prepare an environmental overview of the general well site areas (Techman Report). It was the opinion of this group that the proposed well sites and access roads "will not significantly add to existing land use effects on wildlife in the study area". It contended that oil well development should not be separated from a number of other land uses in the Serviceberry Creek area which have reduced, and continue to reduce, wildlife capability in the area. These land uses include:

(a) Agricultural activities in the area of the well sites.
(b) Railroad development along Serviceberry Creek.
(c) Cattle grazing on valley bottom lands.
(d) Telephone line and gas pipelines in the valley bottom.
(e) Vehicle access into valley bottom.
(f) Sewage lagoon and feedlot located in the floodplain of Serviceberry Creek.

The Techman Report concluded that the incremental effects of the well site development on wildlife in the vicinity of the 6-25 location would be negligible. The development of an access road to the well site may provide additional access to wildlife habitat in the valley bottom, however, Western Decalta stated it would construct necessary gates and fences to restrict vehicle access. It was pointed out that access to the valley bottom currently exists via the developed north-south road allowance running along the east boundary of section 25.

The applicants contended that the area of land affected (1.6 hectares for the 6-26 well site and access road) was limited, compared to the area rendered incompatible as wildlife habitat by other land uses. The effect on wildlife in the general area of the 6-26 well site would be short term avoidance of the immediate vicinity during the construction, drilling, clean-up, and equipment installation phases. Thereafter, disturbance would be limited to the noise of the pumping unit, about one visit per day by the production operator, and weekly removal of oil by tank truck. If several producing wells were completed, Western Decalta would investigate centralization of production equipment. Adequate fences and lockable gates would be installed to restrict public access. It was the applicant's contention that this restriction of vehicle access represents an improvement over the current situation.

The Techman group advised that Peregrine falcons, Prairie falcons, and owls were considered in its study. The Peregrine falcon is listed as an endangered species but no longer breeds in this area and no nests have been recorded in the area since about 1968. The Canadian Wildlife Service (CWS) plans to reintroduce the Peregrine falcon beginning after 1982 in an area some 28 to 38 kilometres to the northeast. If old nests or historical nest sites exist, the falcons would return to these first. The impact on the Peregrine falcons was considered by the Techman group to be minimal because construction at the well sites would occur before the reintroduction program and the noise from the pumpjack would be minimal. The Peregrine falcon is an aerial feeder (preys on small birds on the wing) and, therefore, the proposed well sites would not disturb their feeding habits.

The Techman group advised that there are no good nesting sites for the Prairie falcon in the immediate vicinity of the well sites. They also advised that the number of sightings and nest sites is information that is not available from the CWS.

With regard to owls, the Techman group suggested that there is potential habitat for several species in this area, however, none are native to the area. The group advised that although the 6-26 site is a potential nesting ground for the burrowing owls, they would likely be attracted to the larger grassland regions in the surrounding areas.

The applicant suggested that adequate precautions could be taken at the well sites to ensure that contaminants do not get off the lease or get into any water course. Precautions would include regular monitoring of the production sites, construction of dikes around the tanks and well sites and the containment of drilling fluids in steel tanks, if deemed necessary by the Board. The applicant advised it would ensure that adequate surface casing is set and cemented in place to prevent contamination of ground water supplies.

5.2 The Interveners' Views

The interveners said that the proposed 6-25 well site and access road would remove from production valuable Class 2 agricultural land which has the potential of being upgraded to Class 1 with irrigation. Mr. Kettenbach suggested that the northwest quarter of section 25 is being considered for irrigation within the next few years and the location of the access road and well site would interfere with those plans. The access road proposed by Western Decalta would be placed precisely where an irrigation ditch has been planned.

The local interveners contracted Graham C. D. Griffiths, Ph.D. to prepare an environmental overview of the general well site areas (Griffiths Report). It was Dr. Griffiths position that the major concern affecting both well sites was the need to restrict access to the valley of Serviceberry Creek.

Dr. Griffiths expressed concern that the 6-25 site would provide easy public access to wildlife habitat on the creek bottom. He also expressed concern that trampling of the natural vegetation in the valley could occur as well as disturbance of the falcons nests (located approximately one mile from the proposed well in 6-25). A further concern was that the site would be on a steep slope and that polluted runoff from the well site could damage adjacent agricultural land.

It was the view of the local interveners that fencing the sites and locking gates at the entrances would not prevent people from entering these areas. Their experience had been that these gates are either not kept locked or are broken by hunters and others.

Mr. Kettenbach pointed out that it would not be possible to restrict access to the 6-25 well, since there was no fences between sections 25 and 26 which a gate could be attached.

Dr. Griffiths' primary concern with respect to the 6-26 proposed location and access road, as with the 6-25 location, was that easy access would be provided into the valley of Serviceberry Creek. He stated that the well site would be located adjacent to a water course leading to Serviceberry Creek as well as near an area containing springs. The general area is also subject to flooding, according to several of the witnesses. He said further hydrological studies should be required of Western Decalta to determine the potential of the 6-26 location for water pollution. Dr. Griffiths agreed that the amount of vegetation that would be destroyed by the well site would be fairly limited.

E. Bruns of the Fish and Wildlife Division suggested that the 6-26 development would reduce the food supply for certain wildlife species because of the land taken up by the well site and access road, but more importantly because certain animals such as the Prairie falcons would avoid the area. He further suggested that the effect on wildlife in the area would be long term in that they will lose food, shelter, and security.

Other local interveners expressed a concern that the area would lose its status as a nature educational area for school children.

The interveners agreed that some of the current land uses in the area which include the railroad, cattle grazing, and agricultural activities may represent negative impacts on wildlife and wildlife habitat, causing further environmental disturbances to many species in the Serviceberry valley. The interveners indicated Serviceberry Creek represents a northern extreme to the natural range of such species as pheasant, falcons, passerines, and burrowing owls.

5.3 The Board's View

With regard to the 6-25 location, the Board notes that a relatively large amount of agricultural land would be required for the access road (5.9 acres) and the well site (2.8 acres). The Board also recognizes that the well site will cause a certain amount of inconvenience to the farming operation, however, it is satisfied that the negative agricultural impact should not preclude locating the well as proposed.

Alternative access roads were considered at the hearing, however, a more satisfactory one was not identified. The Board, therefore, accepts the access road selected by Western Decalta but would also approve any other route mutually acceptable to the applicant and intervener.

The Board is satisfied that adequate levelling and diking would prevent any erosion or runoff problems. Since the well site is located above the valley bottom, some 150 metres north of the CNR tracks, increase in vehicle access would be limited and would have minimal impact on wildlife in the valley.

The 6-26 location would have very little agricultural impact since the area is currently used for grazing. The Board, however, has serious concerns respecting the overall impact of the proposed 6-26 well site and access road on the natural setting and wildlife of the creek valley. The additional access to the valley that would be provided as well as the close proximity of the well to the creek led the Board to the conclusion that the well should not be drilled where proposed.

6 REDUCTION OF SURFACE IMPACT

6.1 The Applicant's Views

The applicant advised that it had investigated the possibilities of directionally drilling the wells from other surface sites to the subsurface locations selected, however, it concluded that the additional cost and risk involved would not warrant such an operation. It was estimated by the applicant that to directionally drill either of the wells, a horizontal distance of 230 metres would cost an additional $170,000.

When questioned about the possibility of coming into the 6-26 proposed location from the north, the applicant advised that such access would be difficult because the railway track bed is about 20 feet (6.1 metres) above the valley floor in the area and a great deal of fill would be required. It was estimated that an access road from the north would cost about $25,000 as compared to $6,000 to $8,000 for the road as proposed by Western Decalta. Building the access road from the north was not rejected as a possibility by the applicant.

The applicant examined several other routes of access to the proposed 6-25 well site, however, decided on the route in its application because it followed the fence line and property boundary, thus minimizing the amount of disturbance and inconvenience. Other routes were rejected because: (i) the route would divide a cultivated field, (ii) another affected landowner would not agree with the route, or (iii) the route would involve crossing the creek and the railway.

Western Decalta advised that steel tanks would be used to contain drilling fluids, if so directed by the Board or if, when the sump is being dug, springs are encountered. The applicant estimated that to use such tanks would add $15,000 to $25,000 to the drilling costs. Dikes would be constructed along the lower sides of the leases to contain fluids.

Oil well pumping units would be electrified, however, initially pumps would be driven by gas motors. To reduce the noise of the pumping unit, the motor would be muffled and housed. If the pumping units are electrified, the lines would be buried, if so requested by the surface owner.

To reduce the possibility of public access to the valley bottom, Western Decalta would install double locked gates at the entrance to the sites.

6.2 The Interveners' View

So that access to the valley of Serviceberry Creek is not provided, the local interveners suggested that locations other than the ones proposed should be found. It was suggested that alternative locations to the ones proposed in 6-25 would be in 12-25, 13-25, or 14-25. Such locations would be further away from the creek bottom, the access roads would be shorter (resulting in less land being taken out of cultivation) and would have less effect on future irrigation plans.

Selecting a drilling location north of the railway tracks, in 11-26 rather than in 6-26 as proposed by Western Decalta would be acceptable to the interveners. For such a location, the well could either be directionally drilled or vertically drilled depending on the importance of terminating the well in 6-26. Such a location would have minimum impact on the wildlife and environment of the area.

It was suggested by Fish and Wildlife that any access roads or pipelines that must be located in the valley be perpendicular to the valley's trend and not parallel to it. This would reduce the actual area disturbed along the valley.

6.3 The Board's Views

In the Board's view the impact of the proposed 6-25 well is not so great as to require its relocation. Because of the uncertainty of the irrigation plans on this land it is difficult to determine a preferred access route. However, the Board would expect that negotiation between the applicant and the affected landowners would result in the selection of a reasonably satisfactory route and access road design. The Board finds that the proposed access road is long but acceptable, since it does not unreasonably cut up the field as it is now being farmed.

The Board believes that access to the valley and impact on wildlife would be significantly reduced by moving the 6-26 well site out of the valley. The Board also believes that if the 6-25 well were drilled first, it would provide further information as to whether a subsurface location out of the valley would be feasible for 6-26. In addition, the Board has not rejected the possibility of directionally drilling the 6-26 well from a location away from the creek valley after the reservoir has been better delineated. The Board concludes that the 6-26 well should not be approved at this time.

7 DECISION

The Board grants the application by Western Decalta Petroleum (1977) Ltd. to reinstate the well licence for Decalta et al Rockyford 6-25-26-23. If a route of access other than that proposed is more favourable to the surface owners and is acceptable to the applicant, the Board would expect such a route would be used.

The Board denies the application by Western Decalta Petroleum (1977) Ltd. to reinstate the licence for the well, Decalta et al Rockyford 6-26-26-23, for the following reasons:

1. The well site and access road would disturb the somewhat unique natural setting.

2. The well site is in close proximity to a stream and also is on the floodplain.

3. Information from the drilling of the 6-25 well may show that other locations, which would have less of a surface impact, are just as acceptable from a subsurface viewpoint.

Issued at Calgary, Alberta, on 5 June, 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy, P.Eng.
Vice Chairman

VE Bohme

V. E. Bohme, P.Eng.
Board Member

J. A. Bray, P.Eng.
Acting Board Member

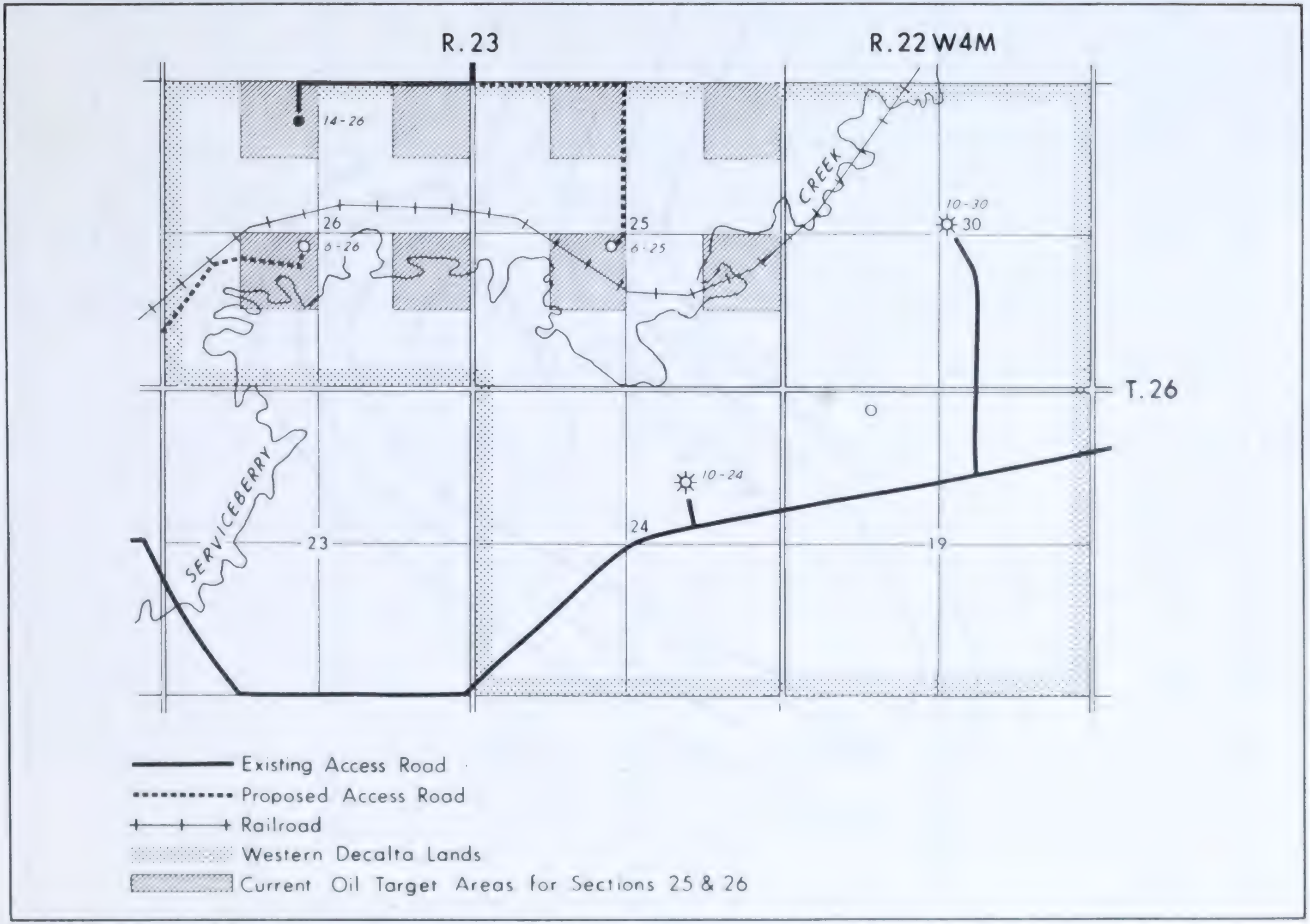
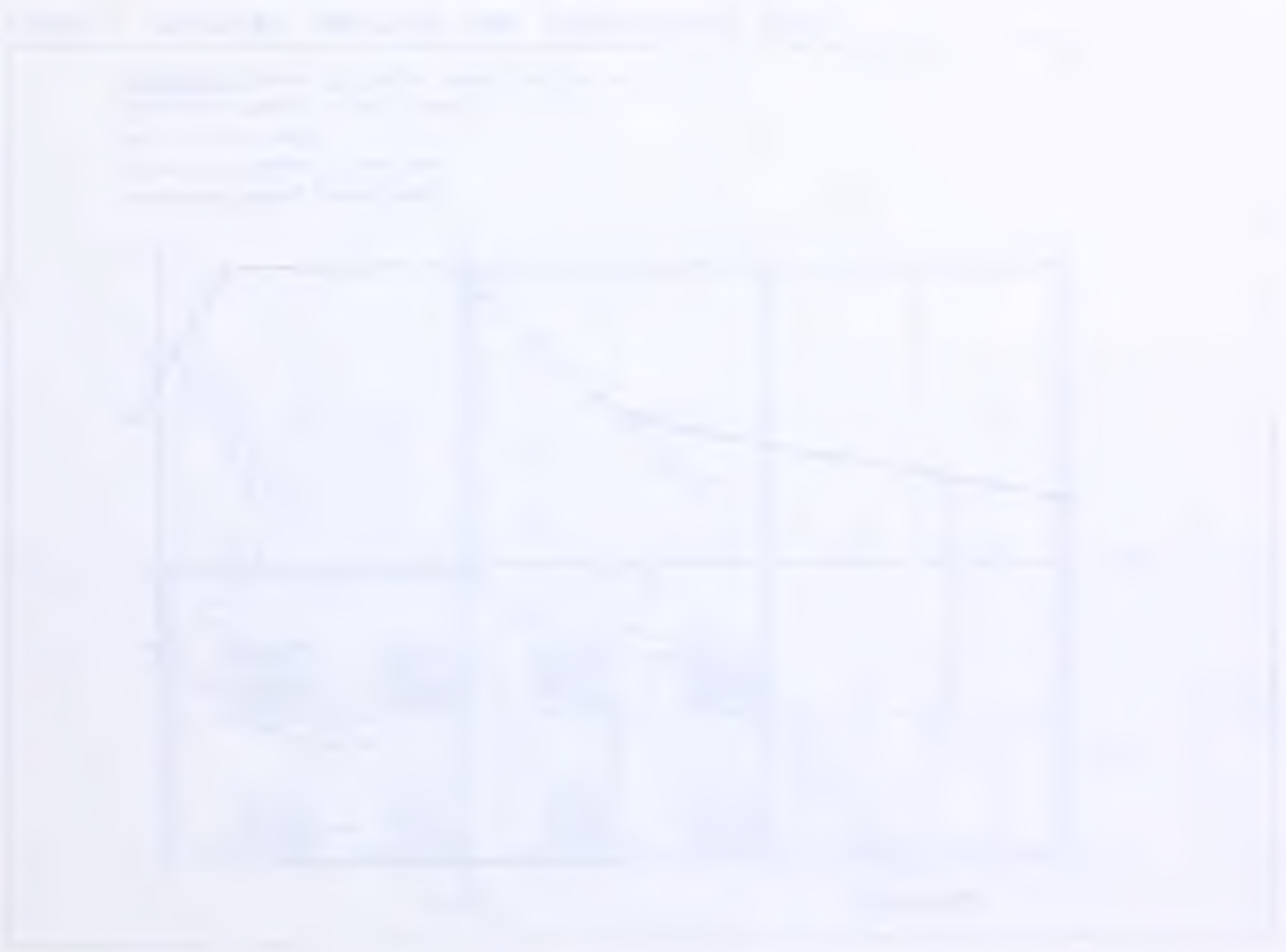


FIGURE 1 PROPOSED WELLSITES AND SURROUNDING AREAS



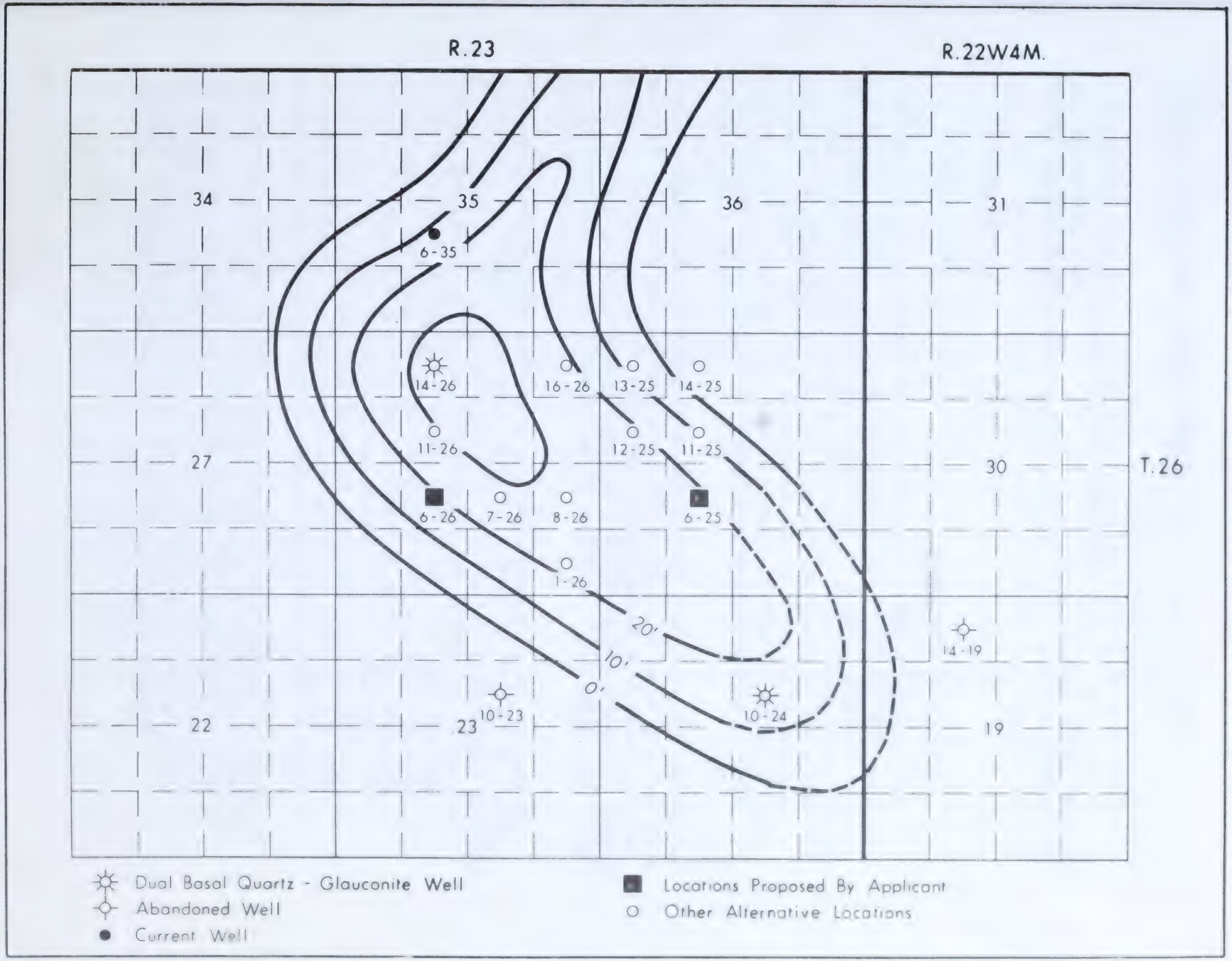


FIGURE 2 ISOPACH MAP OF BASAL QUARTZ SAND (based on data submitted by Western Decalta)

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

PHILLIPS PETROLEUM COMPANY WESTERN HEMISPHERE
GAS PROCESSING PLANT Decision 81-12
MORLEY - GHOST RIVER AREA Application 801022

1 INTRODUCTION

1.1 Application and Hearing

Phillips Petroleum Company Western Hemisphere applied, pursuant to section 38 of The Oil and Gas Conservation Act (the Act), for approval of a scheme for the processing of sour gas in a plant proposed to be located at one of three sites in the Morley - Ghost River Area. The applicant's preferred site for the proposed gas plant is the northeast quarter of 2-26-7 W5M (Site M) adjacent to the existing PanCanadian Morley plant. Phillips also requested that alternative sites at Lsd 4-36-26-8 W5M (Site PR1) and the northeast quarter of 29-26-7 W5M (Site P1A) be considered.

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The gas plant would be designed to process 592 thousand cubic metres per day (10^3 m^3/d) of raw gas from which 475 x 10^3 m^3 of sales gas and 119.8 tonnes of sulphur would be recovered. A maximum of 6.89 tonnes per day (t/d) of sulphur dioxide (SO_2) would be emitted to the atmosphere through an incinerator stack 100 metres (m) in height at Site M or 80 m in height at Sites PR1 or P1A.

The application was considered at a public hearing on 22, 24, and 27 April 1981 in Cochrane, Alberta, with G. J. DeSorcy, P.Eng., N. Strom, P. Eng., and Dr. R. S. Weaver, sitting. Dr. Weaver is Executive Director, Alberta Environmental Centre of the Department of the Environment and was appointed an Acting Board Member for purposes of this hearing. In its notice of hearing, the Board indicated that, in conjunction with hearing the specific application for approval of the gas processing plant, it would hear representations respecting the impacts of the entire project, including the proposed gas plant, the preferred and alternative plant site locations, gas gathering systems, and field production facilities related to each of the three proposed sites.

The general area and each of the proposed plant locations are shown on Figure 1. Although potential impacts related to the proposed routing of gas gathering pipelines were identified in conjunction with the application, technical details of the pipelines and related facilities for which Board approval is required would be considered at a later date by the Board, upon receipt of the specific applications.

The following table lists those who appeared at the hearing.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Phillips Petroleum Company Western Hemisphere (Phillips) A. L. McLarty	A. A. Hochstein, P.Eng. G. L. Brown* M. J. Davies* C. A. Seright* J. A. Sames* *of Western Research and Development Ltd.
Stoney Band of Indians (Stoney Band or Band) R. C. Smith R. Elliot	Chief John Snow
Council of the Summer Village of Ghost Lake (Village) J. A. W. Blake	J. A. W. Blake
Ghost Valley Protection Committee (Protection Committee) A. H. Trawick	H. S. Walton (for the Fitness Ranch) J. R. Century, P.Geol. R. T. Clare, P.Eng. of Colt Engineering Corporation R. C. McDowell A. M. White M. White (for Saddle Peak Rides) J. Richards (for Devil's Head Ranch) D. A. Richards (for Saddle Peak Rides)
W. A. Wasson A. H. Trawick	W. A. Wasson
Alberta Outfitters Association D. A. Richards	D. A. Richards
The 6th Calgary Boy Scouts Group Committee (Boy Scouts) R. A. Miller	T. Carlyle
Kings' Fold Foundation (Kings' Fold) J. A. Howard	Rev. R. H. Hall

THOSE WHO APPEARED AT THE HEARING cont'd

Principals and Representatives (Abbreviations used in Report)	Witnesses
David H. McDougall Ranch (McDougall Ranch) W. F. McKendrick	W. F. McKendrick
R. E. Wolf R. E. Wolf	
Calgary Regional Planning Commission (Planning Commission) M. C. Cullum S. Palmer	
Improvement District No. 8 Advisory Council (ID No. 8) M. Richards	M. Richards
Alberta Environment staff S. L. Dobko, P.Eng. K. Smith	
Energy Resources Conservation Board staff D. A. Holgate E. P. Moeller, C.E.T. A. Cassley, P.Eng.	

J. M. Enns, the Town of Cochrane, and the Sierra Club of Western Canada filed interventions but did not appear at the hearing. In addition, the Board received a submission from Alberta Transportation under Section 26 of the Board's Rules of Practice concerning upgrading of Secondary Road 940.

2 BACKGROUND

Between 1972 and 1975, seven wells were drilled to delineate the Salter Field, resulting in four shut-in sour gas wells. In 1973, Phillips, in respect of the Salter Field, PanCanadian Petroleum Limited (PanCanadian), in respect of the Morley Field, and Shell Canada Resources Limited (Shell), in respect of the West Jumping Pound Field, considered a proposal to construct a single common gas plant for processing gas from all three fields. The companies concluded that a common plant was impractical since the West Jumping Pound Field gas contained hydrocarbon liquids and would have required an entirely different gas processing train than that necessary for the Morley and Salter Fields. Shell proceeded independently for approval to construct the Jumping Pound gas plant.

Subsequently, Phillips and PanCanadian commissioned a site selection study to determine a location for a second single plant to process gas from the Morley and Salter Fields. In 1976, Phillips decided to defer the Salter gas development until it had obtained a firm sales gas contract. PanCanadian had a sales gas contract and proceeded with an application to the Board to build a plant at Morley to process its Morley Field gas only. PanCanadian's application was considered by examiners at a public hearing in Calgary on 27 June 1978. The application was subsequently approved and the plant was built.

Phillips subsequently obtained a gas sales contract and has now applied to the Board for approval to construct a gas processing plant in the Morley-Ghost River area at one of three alternative sites in the fringe of the Rocky Mountain Foothills.

3 INTERVENTIONS

The majority of the interveners supported Site M as being the least objectionable of the three proposed sites and opposed development at Sites PR1 and P1A. They were concerned with sulphur transportation routes, safety, plant and stack visibility, and emissions. McDougall Ranch opposed Site M in preference to Sites PR1 and P1A.

R. E. Wolf appeared for cross-examination of the applicant only, and questioned the applicant regarding the feasibility of using a wet air oxidation process with limestone or alternatively, the re-injection of the SO_2 tail gas into deep formations as means of fully eliminating SO_2 emissions.

The Planning Commission advised the Board that for Site P1A the proposed development does not conflict with its 1971 regional plan. Sites PR1 and M are not on private lands and thus are outside the jurisdiction of the Planning Commission. ID No. 8 advised that it would prefer Site M, and pointed out that a land-use bylaw being developed by the Minister of Municipal Affairs may prohibit a gas plant development in the Site P1A area because it is very near to a critical wildlife zone.

4 ISSUES

The Board considers the issues regarding the application to be:

- Board jurisdiction respecting the application,
- requirement for additional processing capacity in the area and the feasibility of using existing facilities,

- approval of a gas processing plant in the alternative, and selection of the appropriate site if a new plant is required, and
- specific site-related matters.

5 BOARD JURISDICTION RESPECTING THE APPLICATION

Prior to hearing the applicant's evidence, the Board dealt with a preliminary objection put forward by counsel for the Stoney Band. It was submitted by the Band that the Board lacked the jurisdiction to hear the application insofar as it concerned Site M, the site on the Stoney Reserve. The Band argued that jurisdiction over Indian Reserves lies with the Government of Canada pursuant to the British North America Act and that Indians had a special status conferred upon them by the provisions of the federal Indian Act. The Band was, however, prepared to participate if the Board found it had jurisdiction, as long as its objection was noted on the record. The applicant, in response, argued that section 88 of the Indian Act, by making provincial laws of general application applicable to Indians unless they conflict with the Indian Act, made the provisions of The Oil and Gas Conservation Act and Regulations applicable to Indian lands. In support of this contention, Phillips argued that the provincial Act dealt with matters of general application such as conservation, safety, environmental matters, and public interest matters. The Act, argued Phillips, regulated conduct as opposed to land or land uses. Phillips submitted further that it was not subject to the Indian Act and that Site M was only one of three alternative sites.

Reference was also made by counsel for Phillips to a previous decision of the Board regarding the PanCanadian gas plant now operating on Site M. In response to a similar objection by the Band, examiners appointed by the Board ruled that the Board had jurisdiction to hear the matter then before it.

The Board considers that it has the jurisdiction to hear and decide the Phillips application. The Board believes that The Oil and Gas Conservation Act and Regulations do not constitute legislation in respect of Indians or Indian bands specifically but is legislation of general application within the province, the operation of which is not specifically precluded by the federal Indian Act.

6 REQUIREMENTS FOR ADDITIONAL PROCESSING CAPACITY IN THE AREA AND THE FEASIBILITY OF USING EXISTING FACILITIES

6.1 Views of the Applicant

Phillips stated that it has now received a firm gas contract with Pan-Alberta Gas Ltd. (Pan-Alberta) to sell gas beginning in 1982 and must now start to produce the shut-in reserves in order to satisfy the requirements of its leases, and recover some return on the investment made in the past eight years. According to the terms of its contract with Pan-Alberta, Phillips must process the sour natural gas so that it meets sales gas specifications.

The applicant stated that it had considered processing its gas at the existing Wildcat Hills, Morley, Jumping Pound, and Burnt Timber plants, but that none had enough excess capacity to process the Salter Field gas. In addition, the cost of raw sour gas transmission and the cost of plant expansion would be prohibitive. Processing its gas at the Wildcat Hills plant would require a plant expansion and a 30 to 32 kilometre (km) sour gas pipeline crossing the Stoney Indian Reserve and the Ghost River, or alternatively, Waiparous Creek. Use of the Jumping Pound plant would require a plant expansion and approximately 38 km of sour gas pipeline crossing the Stoney Indian Reserve and Bow River. Use of the Burnt Timber plant would require a plant expansion and approximately 35 km of sour gas pipeline constructed through rugged, environmentally-sensitive lands.

The Morley gas plant was designed to handle Morley Field gas only, and does not have excess capacity to process Phillips' gas. It is significant that the Morley plant site was originally selected by PanCanadian and Phillips as the preferred site for processing of both Morley and Salter Field gas. The present plant site has sufficient space for a single large plant with capacity for both gas fields or for two separate plants. The applicant concluded that Site M is the preferable site for the location of its plant. However, it sought approval for Sites PR1 and P1A in the alternative.

6.2 Views of the Interveners

R. E. Wolf contended that the gas should be processed at the Wildcat Hills plant and that no plant should be built in the area that results in any acid gas emissions to the atmosphere. Mr. Wolf did not present his intervention at the hearing although he questioned the applicant.

The Stoney Band endorsed Site M on the Reserve because it would receive monetary and other benefits from the gas plant operation.

6.3 Views of the Board

The Board recognizes that Phillips has drilled wells and has discovered certain reserves of gas in the Ghost River area for which it has obtained a sales contract with Pan-Alberta and has the right to produce. The Board's estimate of the remaining marketable reserves of gas in the Salter Field as of 31 December 1980 is some 2.5 x 10^9 m^3. The Board believes that these reserves are substantial and should be produced and recovered. The Board notes that the gas would need to be processed in order for it to meet pipeline specifications.

With respect to the feasibility of processing Phillips' Salter Field gas reserves in an existing nearby plant, the Board has considered the Wildcat Hills, Morley, Jumping Pound, and Burnt Timber plants. The Board believes that the most significant factor to be assessed in considering the use of existing plants is that related to sour gas pipeline lengths and routing. Thus access to the Wildcat Hills plant located in Lsd 6-16-26-5 W4M would require some 26 km of high pressure sour gas pipeline crossing the Ghost River and running parallel to Highway 1A along the north side. Access to the Burnt Timber plant, located in Lsd 10-13-30-7 W5M, would require some 35 km of line running northeast of the Salter Field, crossing the Ghost River and traversing rugged terrain, characteristic of the Foothills region. Access to the Jumping Pound plant in Lsd 13-13-25-5 W5M would require some 32 km of high pressure sour gas pipeline running east southeast of the Salter Field and would include a crossing of the Bow River. The Board believes that the potential environmental impact of any of these options is sufficiently adverse as to discount any one of them in favour of a more nearby location. On the other hand, the Morley plant is located adjacent to Phillips' preferred Site M, and use of it would involve no incremental sour gas pipeline to that which would be required if Phillips were to construct a second plant at Site M. Therefore, the Board believes that, from the point of view of minimizing the length of required sour gas pipelines, the Morley plant clearly would be the most desirable of the existing plants in the area to use. Consequently, the Board has not considered the other plants further.

With respect to the availability of excess processing capacity at the PanCanadian plant, the Board notes that the proposed rate of production of the Phillips reserves (592×10^3 m^3/d) substantially exceeds the maximum design inlet capacity of the PanCanadian plant (282×10^3 m^3/d) and therefore, substantial expansion of the PanCanadian plant would be necessary in order for it to be used for the Phillips' reserves. Moreover, the hydrogen sulphide (H_2S) content of the Phillips' gas would average 15.35 per cent while the PanCanadian plant is designed for an average inlet gas H_2S concentration of about 5 per cent. The combination of these differing H_2S concentrations and inlet rates would, therefore, result in a total average H_2S content of some 12 per cent and a total H_2S inlet rate of some 105×10^3 m^3/d, or some 7.5 times the appoved H_2S inlet rate of the existing plant. This substantial increase in the volume of H_2S to be processed would result in the need to modify the most complex portions of PanCanadian's plant, that is, the sweetening and sulphur recovery sections, to the extent that the Board believes it would require rebuilding of those sections, and possibly other sections, rather than expansion of them. Thus, the Board believes that use of PanCanadian's plant would essentially require construction of a new plant rather than an expansion. In addition, the PanCanadian plant would need to be shut in while the rebuilding was taking place, resulting in a substantial loss in revenue to PanCanadian. The Board also recognizes that, in order for Phillips to use the Morley plant, difficult commercial negotiations between the two companies would result, since it appears that there would be little or no incentive for PanCanadian to incur the substantial cost of effectively abandoning its existing plant and constructing a new one. Further, were the parties not able to conclude mutually satisfactory negotiations, use of PanCanadian's plant by Phillips might require an application by Phillips to have PanCanadian declared a common processor. Therefore, the Board will not require Phillips to use the PanCanadian plant. This decision is taken in this particular instance due to special circumstances, notwithstanding that the Board generally believes that one large plant in an area would be better than a multiplicity of small plants. The Board believes, therefore, that use of an existing plant is not feasible in this case, and it thus must decide whether Phillips' proposal to build a separate new plant in the area is acceptable.

7 SITE SELECTION AND APPROVAL IN THE ALTERNATIVE

7.1 Views of the Applicant

In the applicant's site selection study, eleven candidate sites for a gas plant were identified and evaluated. Three sites were the subject of a comparative environmental impact assessment: Sites M, PR1, and P1A (see Figure 1).

In the view of the applicant, the major advantages of Site M are: access and service corridors are largely in place; addition of a second plant at the site would result in minimal physical disturbance; insignificant impacts on residential, recreational, and agricultural land use as well as wildlife habitat; good access to communities for plant personnel; existing direct access to market for sulphur and gas sales; the site is the preferred on-reserve location of the Stoney Band Council; lower capital costs; and environmental effects are reduced due to the presence of the PanCanadian plant.

In the view of the applicant, the major disadvantages of Site M are: distance from the sour gas wells; length of the sour gas gathering pipeline; visibility of the site, although visual impact would be incremental due to the existing PanCanadian plant and would be minimized through colour camouflaging; a greater number of residences exist in the vicinity of Site M; and uncertainty of site availability due to unresolved negotiations with the Stoney Band.

For Site PR1, the major advantages as seen by the applicant are: immediate proximity to the gas wells, minimizing the length of sour gas pipeline and minimizing the distance between operators and well sites; minor residential and social impact due to the secluded nature of the area; minor land use impact, since the site is located on land with no capability for alternative uses, including wildlife, agriculture, recreation and forestry; minimal gas plant visibility; and minimal overall environmental impact of all possible new gas plant locations.

The major disadvantages of Site PR1 are: physical impact resulting from construction of a new gas plant and service corridors; possibly significant impact on future residential and recreational development potential of this portion of the Stoney Reserve; and significant public concern by local off-reserve residents regarding the possible transport of sulphur on Highway 940.

For Site P1A the applicant said that the major advantages are: close proximity to the wells and good construction and servicing potential; and low gas plant visibility and least significant environmental impact relative to other possible off-reserve new plant sites.

Finally, in the view of the applicant, the major disadvantages of Site P1A are: physical impact associated with establishment of a new gas plant and service corridors; more significant objection by local residents and recreational establishments relative to Sites PR1 and M; more significant impact on future residential and recreational development potential; and significant public conern with possible transport of sulphur on Highway 940.

Site M is the applicant's preferred site for the gas processing plant. By locating the plant at Site M, environmental impacts would be minimized and both capital and operating costs would be lower. From a technical perspective, all three sites were considered to be equivalent. The applicant was prepared to construct and operate the plant at any one of the three sites.

The applicant pointed out that the availability of Sites M and PR1 is contingent on negotiations with several parties, including the Stoney Band, The Department of Indian Affairs and Northern Development, and PanCanadian. These negotiations have become unusually complex due to the fact that the lands on which the proposed unit wells are located are "disputed" lands with respect to ownership. Unless negotiations can be successfully concluded, Sites M and PR1 would effectively be precluded. Consequently, the applicant requested the approval of the gas processing plant described in the application at each of the proposed sites. The applicant also requested that the approval specify a primary site with the approval conditional such that the approval for the non-primary sites could not be utilized without the further authorization of the Board.

The applicant requested that Site M be approved as the preferred site. The applicant also requested that Site P1A be considered and evaluated, not only as an alternative comparable to Sites M and PR1, but also in the context that Sites M and PR1 may not be available as alternatives. In particular, the applicant requested that the Board make a separate evaluation and disposition of Site P1A and that the evaluation be made as if Sites PR1 and M did not exist. If the Board was not prepared to approve or reject Site P1A without some further consideration, then the applicant requested that consideration of Site P1A be deferred.

A key concern in evaluating the three sites was the transport of sulphur. Phillips proposed to transport sulphur in liquid form by truck to another gas plant with sulphur storage capacity, or directly to market. It stated that the preferred route to truck sulphur from Site M would be from the site to Highway 1A and then east on Highway 1A to the railhead at the Wildcat Hills plant for possible further transport to Calgary or Crossfield. The preferred route for Site PR1 would be to truck south through the Reserve on Highway 1A, and the preferred route for Site P1A would be to truck south on Richards Road to connect to the Stoney Indian Road, continue through the Reserve to Highway 1A and then travel east to the railhead.

The alternatives to trucking from Site M would be to truck sulphur through the Stoney Reserve to Highway 1 and then east to the railhead on Highway 1. For Sites PR1 and P1A, the first alternative would be to truck through the Reserve, then to Highway 1 and then east. The second alternative would be to go east to Richards Road, north to Highway 940, then east on Highway 940 to Highway 1A, and then to the railhead.

It was the applicant's view that Site M presented no particular problems in connection with sulphur transport, while sulphur transport would present problems at Sites PR1 and P1A. The applicant further indicated that Sites PR1 and P1A are dependent on establishing a route south to Highway 1A, or upgrading Highway 940. The comparative feasibility of any route was cost-related. On the basis of preliminary feasibility studies, southerly routes from either P1A or PR1 to Highway 1A could be developed. However, these routes were subject to successful negotiations with landowners and the Stoney Band. The applicant indicated that for Sites PR1 or P1A, it may be necessary to use Highway 940 for sulphur hauling until the necessary road construction and upgrading was completed on the transportation routes going south through the Stoney Reserve.

7.2 Views of the Interveners

Eleven interventions were received from groups and individuals for consideration at the hearing. Of the eleven interventions received, nine supported the applicant's preferred Site M, as the location for a plant. The large majority of interveners opposed the construction of a new plant at either Site PR1 or P1A.

The conditional support of the interveners for locating the Phillips plant at Site M was based on the existing industrial status of the site and the fact that environmental and social-community effects would be incremental to those of the existing PanCanadian plant. Furthermore, the concern over transportation on Highway 940, particularly sulphur transport, would be eliminated. Most of the interveners also felt that conflicts with land-based and facility-based recreation and critical wildlife habitat would be less at Site M than at either PR1 or P1A. Although Site M was supported as a location for the plant, interveners qualified their endorsement with the condition that certain concerns would be adequately addressed. These concerns included SO_2 monitoring, utilization of the best available technology for sulphur recovery, stack height, measures to protect against H_2S emissions, transportation of sulphur directly to Highway 1, and maximum integration of the proposed new plant with the existing plant including use of a common incinerator stack.

Transportation impacts, particularly regarding safety aspects of transport of liquid sulphur by 20-tonne trucks, were a major concern to area residents. Interveners also foresaw problems arising from increased noise and access, which would detract from the desirable features of the area. The Protection Committee indicated that routing the sulphur transport south through the Reserve would not reduce its objections to Sites PR1 or P1A due to the significance of other impacts associated with a plant at those locations, particularly conflicts with recreation and the present non-industrial status of the area.

The major factors respecting Sites PR1 and P1A identified by interveners opposing the development at either site were:

1 Transportation impacts (sulphur transport, increased traffic, noise, and road upgrading and realignment).

2 Specific conflicts with existing and future recreation developments, and in general, conflicts with the long-term potential recreational value of the area.

3 Visual impacts (aesthetics).

4 Social/environmental disturbances resulting from industrialization altering the present character of the area.

They also expressed concern about Sites PR1 and P1A regarding proximity to critical wildlife habitat, air quality, odour, water quality, effects on fisheries, increased access, and effects on cattle operations.

ID No. 8 stated that a gas plant, particularly at Site P1A, may conflict with ID No. 8 General Municipal Plan, in terms of critical wildlife habitat.

The McDougall Ranch opposed Site M in preference to Sites PR1 and P1A, and was the only intervener totally opposed to Site M.

With respect to the concept of approval in the alternative, several interveners expressed their views. The Stoney Band felt that satisfactory arrangements could be negotiated with Phillips for the use of Site M as well as for access roads and pipeline easements. The Protection Committee argued that the Board, if it were to accept the concept of approval in the alternative, would be abdicating its responsibility to the applicant to determine the public interest regarding siting. It requested the Board to approve only one site, Site M, and suggested the Board should not delegate any of its decision-making authority back to the applicant. Kings' Fold requested that no alternatives be approved by the Board, and argued that there was no evidence that Site PR1 is the second-best site, nor evidence that P1A is the third-best site. Further, Kings' Fold requested that a decision regarding Sites PR1 and P1A not be held in abeyance, but rather they should be dismissed. Mr. Wasson specifically requested that, if further consideration is given to Sites P1A or PR1, the Board defer its decision pending the results from on-site horizontal atmospheric dispersion studies being conducted by Phillips for Site PR1, and its study regarding sulphur transport. Mr. Wasson further requested that the interveners have an opportunity to examine and comment on the results. Mr. Walton, on the other hand, suggested that a decision, one way or another, should be made now, respecting the suitability of Site P1A to remove uncertainty in the minds of landowners near the site.

7.3 Views of the Board

The Board rejects the concept of approval of plant site locations in the alternative. While the Board recognizes the particular circumstances surrounding the negotiations for the use of the lands at Sites M and PR1, the Board does not believe it would be in the public interest to approve the construction and operation of a gas processing scheme at each of the proposed sites, even though only one of the three sites would actually be used. The Board has no authority to delegate its responsibilities to another party, and in this case, the acceptance of the concept of approval in the alternative as presented by the applicant may constitute such a delegation. Additionally, the Board does not believe it would be in the public interest to approve and allow construction on a site which may be significantly less desirable than the best site available.

The Board concurs with the applicant and the majority of the interveners that Site M is the preferred site for the gas processing plant. The evidence clearly indicates that Site M is preferable to Sites PR1 and P1A in terms of minimizing biophysical and social-community impacts, and in terms of technical and economic considerations. The Board finds particularly significant the disadvantages associated with Sites PR1 and P1A regarding the additional impacts associated with the establishment of another gas plant site and service corridors, the implications for existing and future residential and recreational development, and the concerns about the possible transport of sulphur on Highway 940.

The Board rejects the applicant's request that the Board make a separate evaluation and disposition of Site P1A. Such a determination is not in the public interest, and is premature, since no evidence is before the Board that Sites M and PR1 are definitely not available to the applicant at this time.

Consequently, the Board will in the remainder of this report deal only with the suitability of Site M for the proposed plant.

8 SPECIFIC SITE-RELATED MATTERS

8.1 Combined Incinerator Stack and Stack Height

Phillips stated that an incinerator stack 100 m high would be built to disperse a maximum of 6.89 t/d of SO_2 to the atmosphere. The top of the stack would be about 4 m higher than the existing PanCanadian stack of 69 m in height. A maximum tree top concentration of SO_2 of 0.162 ppm would result from the combined emissions from both the plants. This compares to a standard of 0.17 ppm as an average one-hour maximum permissible concentration. Phillips rejected the suggestion of a combined stack with PanCanadian on the grounds that:

- it is difficult to assign responsibility for excessive emission, should this occur;
- the additional pipelines required to transport the tail gas from the Phillips plant to the incinerator at the Morley plant would introduce problems of corrosion and cost; and
- inadequate dispersion of pollutants would result following a plant turndown or shutdown of the Phillips plant.

The interveners were concerned with the aesthetics associated with a multiplicity of stacks and considered it easier to identify emissions if only one source were present.

The Board is of the view that, although visual impact would be somewhat greater using two stacks instead of a single stack, it may be difficult to assign responsibility to one or the other operator if a single stack were used and ambient violations were to occur as a result of adverse meteorological conditions. Furthermore, PanCanadian's stack would still be necessary for PanCanadian's plant to remain in operation in the event that the Phillips plant is turned down or shut down. The Board is therefore of the opinion that a single stack serving both plants should not be required in this case. Phillips would thus be allowed to use a separate stack and would be required to maintain continuous monitoring of sulphur emissions. The stack design and emission conditions must, however, be based on the recognition that the plumes from the two stacks would overlap to some degree at points of contact with the ground.

8.2 Flare Stack

Phillips stated that a 60-m emergency flare stack would be adequate to maintain provincial maximum SO_2 ground-level concentrations. Phillips believed that this can be achieved by adding sufficient fuel gas to the acid gas, and by plant shutdown if the mechanical problems resulting in the flaring could not be resolved in 20 to 30 minutes. Furthermore, Phillips stated that the probability of adverse meteorological conditions such as trapping and emergency situations occurring at the same time is so low that air quality objectives could be met 99.99 per cent of the time. Phillips also stated that the flare-tip design would take into consideration a wind guard, smokeless operation, and minimizing illumination.

The Board is of the view that, given a proper design of the flare stack and strict operational guidelines to control and minimize flaring occurrences during shutdowns and emergencies, impact on the environment would be minimal. The Board would require specific operational guidelines relating to flaring to be incorporated into the emergency procedures for the plant.

8.3 Air Quality Monitoring

The interveners, especially the Village, expressed concern over the adequate monitoring of SO_2 emissions, since they would impact on the residents of the Village east of the proposed plant site. Phillips stated that it was prepared to monitor over and above the Department of the Environment guidelines to satisfy the Village's concerns, and was prepared to discuss the monitoring results with the Village. Phillips was also prepared to study further the dispersion of pollutants to account for the terrain effects of the area.

The Board finds Phillips' proposal for air quality monitoring to be adequate and acceptable, subject to adherence with the conditions of approvals which are required from the Department of the Environment.

8.4 Possibility of Re-injecting Acid Gas, or Using a Wet Air Oxidation Process

8.4.1 Views of the Interveners

Mr. Wolf contended that no plant should be built in the area that results in any acid gas emissions to the atmosphere. He put forward two alternatives to the proposed stack gas emissions, one being the injection of the incinerator stack gas into deep porous formations encountered by abandoned wells in the area, and the other being use of the Zimpro - AEC Ltd. wet air oxidation (WAO) process using limestone. With respect to the re-injection of tail gas from the incinerator stack, he indicated that he had investigated the geology of the area and had determined that suitable formations were present which would permit this alternative. He also indicated that, alternatively, the WAO process could be used and would result in no acid gases being emitted from the plant. Mr. Wolf stated that plants in Alberta are emitting between 1000 and 2000 t/d of sulphur in the form of acid gas and that the Board should adopt measures to end this form of pollution.

In his cross-examination of the applicant at the hearing, Mr. Wolf implied that a build-up of gaseous oxides from sour gas processing plants on insulators on transmission line structures in the south Calgary area may have caused a so-called power "bump" which had resulted in serious damage to major household applicances in the general Midnapore area of Calgary.

Mr. Wolf also implied in his cross-examination that the capital cost of the proposed incinerator stack and the cost of preparing Phillips' environmental impact assessment report could have been put toward a re-injection system or a WAO process to defray the costs of these alternatives.

8.4.2 Views of the Applicant

Phillips, in response to Mr. Wolf's examination, objected to the idea of re-injecting the tail gas from its proposed plant to a deep underground formation on technical and economic grounds. It stated that a re-injection system would require considerable capital expenditure on two very large compressors of about 2000 horsepower each, one being for a spare system. Phillips stated that the tail gas would have to be compressed to between some 34 000 to 41 000 kilopascals (kPa) if the Mississippian or Devonian Formations were contemplated as the receiving formations for the tail gas. It further stated that the compressors would be large fuel users, and would result in large nitrogen oxide (NO_x) emissions. The gas to be compressed would be over 30 per cent water, and because it would be at 538°C after incineration, the cooling and compression of the gas would cause condensation of the water. Re-injection would thus involve 100 tonnes of water-contaminated SO_2 per day. The disposal of this very corrosive effluent by re-injection would be a significant technical problem and would have significant operating costs associated with it. With respect to potential receiving formations, Phillips stated that, on the basis of drill-stem test information, the Devonian Formation in the area of its proposed project was very tight and would not be suitable for water or gas re-injection. It stated that it intended to produce from the Mississippian Formation in the same area, and that it would not be logical to re-inject the tail gas into the producing formation. Phillips was of the opinion that the shallower zones were also not suitable for injection of either waste water or tail gas. With respect to the feasibility of injecting the off gas from the sulphur recovery unit, that is, the mixture of H_2S and SO_2 which it is proposing to incinerate, Phillips stated that compression of these gases would present serious problems in terms of degradation of bearings, flanges, and other components of the compressors.

On the matter of the WAO process, Phillips stated that it may consider testing a pilot system using it in connection with oil sands development, but that the process had not been considered as a possibility for treatment of the tail gas of its proposed Ghost River plant. Phillips stated that the process is still in a testing or pilot plant stage and has no proven success in Alberta. Phillips stated that, with respect to handling the tail gas from its proposed plant, Zimpro - AEC Ltd. staff were of the opinion that the process had been laboratory tested but had not been field tested to date. Phillips stated that a field test should be conducted on a plant in which a "slip stream" of the tail gas could be taken off and a pilot test run on it. It stated that, on the basis of the current status of the process, it should not be installed as proven technology, and that it was premature to develop cost estimates for the use of this process in connection with the tail gas from the proposed Ghost River plant.

With respect to the suggestion that the cost of its environmental impact assessment report could be put toward a re-injection system or the WAO process scheme for handling of the tail gas, Phillips stated that the report was one of the mandatory requirements set out by the Department of the Environment and covered more than SO_2 emissions.

8.4.3 Views of the Board

Mr. Wolf did not present witnesses at the hearing to support the matters which he raised in his intervention. Accordingly, the Board's views with respect to these matters is based on Phillips' responses to his cross-examination and on the Board's own knowledge of these matters.

The WAO process is aqueous-phase oxidation of dissolved or suspended organic material. Slurries of organic materials such as fuels and wastes are mixed with compressed air or other oxygen-containing gas, and are oxidized flamelessly in a reaction vessel at moderate temperatures (200-370°C) and pressures up to 21 000 kPa. The Zimpro Inc. process has been used in some 200 installations world wide for the destruction and detoxification of waste streams such as sewage sluges, waste waters, and pulping liquors.

The WAO process is an adaptation of the Zimproc Inc. WAO process. In its present form it is designed to generate a mixture of carbon dioxide (CO_2) and nitrogen (N_2) plus steam for injection into heavy oil reservoirs for enhanced recovery purposes. The pressurized steam and gas exiting the reactor would be charged directly into the heavy oil reservoir; inert ash would be routinely blown out of the reactor and disposed of. The proponent claims that the process enables the use of inexpensive fuels such as petroleum coke or high-sulphur coal, but emits no smoke, particulates, SO_2, or NO_x.

There is no evidence before the Board that either the WAO or Zimpro Inc. processes have been or are intended to be used for tail gas treatment. The processes appear similar to "conventional" fluidized bed tail gas treatment processes involving SO_2 absorbent material such as lime or limestone in that the SO_2 combines with ash components in the case of WAO processes and with the adsorbent material in the fluidized bed case. If a WAO process or modification of one were to be used for tail gas treatment, the use of coke or coal as the oxidation reactor fuel would not appear practical, particularly because of the ash production which would need to be disposed of. Therefore, the Board believes that, if a WAO process could be used for tail gas treatment, it would need to be used in conjunction with a fluidized bed of adsorbent material. WAO processes have been used in connection with coke oven gas clean-up processes. However, in that case, the gas undergoes primary desulphurization yielding a tail gas and blow-down liquor. The liquor is treated using WAO and the gas undergoes further processing for ammonium sulphate and clean coke oven gas recovery.

Assuming the WAO processes could be adapted and modified for gas treatment (such as sour gas plant tail gas or power plant flue gas), a significant advantage over incineration techniques would appear to be virtual elimination of SO_2 emissions. Assuming that a fluidized bed of adsorbent material would need to be provided, the major disadvantage would appear to be the environmental impact of quarrying the adsorbent and disposing of the spent material. Depending on the adsorbent material requirements and spent material disposal volumes, and the distance between the plant site and the quarry and disposal site, the transportation needs for these materials would have to be considered. The Board believes that, in order to adsorb the SO_2 resulting from the proposed Phillips plant, adsorbent material requirements would be substantial. The Board has not studied the matter of equipment size for this scenario in detail, but relating it to the somewhat similar iron sponge process, it believes that the equipment would need to be extremely large in order to handle the volumes of SO_2 and adsorbent material involved. Research is currently being conducted on means to increase the reactivity of limestone to SO_2, through catalysis for example (an increase in reactivity would decrease the adsorbent material and requirements, the energy to fluidize it, and disposal volumes). Capital costs for WAO are higher than for conventional incineration techniques but, as a rule, operating costs are less where waste treatment is involved. This would not be true of tail-gas treatment using WAO since the tail gas would have virtually no heating value, and fuel gas would have to be added.

In summary, the Board does not believe that use of the WAO process is a viable alternative to the incineration of tail-gas at the proposed Phillips plant for the following reasons:

- The WAO process does not appear to have been used nor does it appear to be intended to be used for tail gas treatment, at least in its existing form.
- If the process were adaptable for use, significant quantities of adsorbent material would be required for the process involving quarrying, disposal, and transportation considerations.
- Capital costs for a suitably-modified WAO process, if such were attainable, would be higher than for conventional incineration techniques and operating costs would likely be higher.

With respect to the idea of re-injecting acid gas or tail gas to deep, porous underground formations, the Board believes that several substantial problems would be encountered; however, it sees a possibility at some time in the future, if the problems are resolved, that disposal of tail gas and flue gas by re-injection may become viable. Among the several problems that the Board believes would need to be resolved in order for re-injection to become feasible, the most significant would appear to be reliability of equipment such as compressors. Indeed, the Board believes that a re-injection system would require complete backup, such as duplicate compression facilities and duplicate wellbores, such that if a problem were to occur with one system or part of one system, the other system could be used so that the plant would not need to be shut in. It is important to note here that shutting in a sour gas plant normally results in severe conservation losses and environmental problems such as abnormal emissions and could lead to severe start-up problems, particularly in winter. A duplicate re-injection system would be a significant cost and would have to be weighed against a tail-gas clean-up system. Furthermore, the Board does not believe that a system for re-injection of tail gas would negate the need for a stack at the processing plant.

If a problem were to occur with the plant at any point up-stream of an assumed re-injection system, such as in the sulphur recovery section or sweetening section, sour gas would likely need to be flared while the problem was being rectified or to depressure the plant after shutting it in at the inlet. This flaring would need to be done through a stack which was sufficient in height to result in adequate dispersion of SO_2 to maintain acceptable ground-level concentrations of SO_2.

Prior to approving the re-injection of tail gas to a deep underground formation, the Board would want to be satisfied that the reservoir into which tail gas was to be injected was isolated from any hydrocarbon accumulations which could be produced in the future. Further, drilling in an area in which tail gas was being injected might need to be restricted or even prohibited to prevent the receiving formation from being penetrated. These steps would be necessary because of the very corrosive nature of tail gas and the resulting metallurgical problems which could occur in facilities which penetrate the zone of injection but were not specifically designed for injection purposes. For example, failure of facilities in a producing well completed in a zone which is inadvertently contaminated with injected tail gas from another zone could be a serious problem both in terms of environmental impact and conservation. A further difficulty is that, if a depleted reservoir were to be used for re-injection of tail gas, the conventional wells which were completed in the receiving formation could not be used for tail gas re-injection unless they were equipped with suitable tubing and packers. In other words, the risk that the tail gas could corrode the casing of an injection well, possibly leading to communication between the receiving formation and other formations, or leading to problems on surface, could not be tolerated. No specific underground formation was identified as a suitable zone in which to inject tail gas from the proposed Phillips plant even if all other problems related to injection could be readily solved.

Special metallurgy considerations would have to be made in the design of compression and other surface facilities for handling the tail gas. Because of the substantially increased corrosivity of these gases in the presence of water or water vapour, the tail gas might even require some primary processing such as dehydration. In addition, if the combination of the likely high re-injection pressure necessary to permit the gas to enter the receiving formation and the temperature of the formation were such that the dewpoint of the tail gas was reached, highly concentrated sulphuric acid could form. While this might be beneficial insofar as increasing the pore volume of the formation is concerned, it might also present very serious problems with respect to the casing and the casing cement.

In summary, due to all of the above-mentioned problems, the Board does not believe that the re-injection of tail gas to deep underground formations represents a viable alternative to incineration of acid gas in the proposed Phillips project.

The Board does not agree with Mr. Wolf's suggestion that the capital costs of the proposed incinerator stack and the cost of preparing the environmental impact assessment report submitted by Phillips in conjunction with its application could be put toward a tail gas re-injection system or a WAO process to defray the costs of these alternatives. The Board is not convinced that a stack would not be needed if a re-injection system were installed. Further, the Board believes that, while an absence of SO_2 emissions would somewhat reduce the scope of the environmental impact assessment report, the need for one would not be totally eliminated since there are other impacts to be addressed.

Although the Board does not believe that either of the alternatives suggested by Mr. Wolf was demonstrated to be viable or a better alternative to tail-gas incineration, the Board agrees with Mr. Wolf that all possible avenues for eliminating or reducing sulphur emissions from gas plants in the province should be explored. Accordingly, the Board intends to follow up on the suggestions made by Mr. Wolf, and other possibilities which would reduce sulphur emissions, and ensure that they are fully evaluated and understood. Towards this objective, the Board would expect applicants for future sour gas processing plants to deal with these matters in their applications.

Respecting Mr. Wolf's suggestion that a build-up on insulators of gaseous oxides from sour gas processing plants could cause power surges, the Board has no evidence before it to support this theory. Additionally, the Board does not know of any instances where this has occurred. Consequently, the Board does not consider the possibility of a build-up on insulators to be a reason for denying the Phillips gas plant application currently before it.

8.5 Sulphur Recovery and Tail Gas Clean Up

8.5.1 Views of the Applicant

Phillips stated that it would recover 97.2 per cent of the sulphur produced in the plant by the use of a three-stage Claus process capable of recovering in excess of 97.5 per cent. It stated that a 97.2 per cent sulphur recovery level was in accordance with Informational Letter No. IL 80-24. In addition, it stated the sulphur stack operations would be controlled with the assistance of a continuous stack emission monitor.

Phillips rejected the need for tail-gas clean up at a gas plant built at any of the three proposed sites because the incinerator stack would be designed to meet the emission guidelines and regulations as set out by the Board and the Department of the Environment. It stated that tail-gas clean-up would cost between \$750 000 and \$2 million to install and further that the tail-gas clean up unit would consume about 11.3×10^3 m^3/d of additional fuel for energy. In addition, the applicant stated that additional costs due to operating problems with the unit would be incurred.

8.5.2 Views of the Interveners

Mr. Wolf questioned the applicant as to the viability of recovering 100 per cent of the sulphur using the SCOT process.

The Village requested that a tail-gas recovery unit be installed to reduce SO_2 emissions over the Village of Ghost Lake.

8.5.3 Views of the Board

The Board notes that the PanCanadian plant has an approved minimum sulphur recovery limit of 93.5 per cent, and if the Phillips plant were approved at Site M, it would require a 97.2 per cent sulphur recovery in accordance with IL 80-24. However, if the two plants were considered to be one, the combined sulphur plant inlet stream would require a 97.4 per cent sulphur recovery level. Since the PanCanadian and Phillips plants would be located on the same site, notwithstanding that separate sulphur recovery units and incinerator stacks would be installed, the Board believes the two plants should be considered as one for the purposes of interpretation of the sulphur recovery guidelines. The Board considers this would be consistent with the philosophy behind the guidelines, and furthermore, would provide additional incentive to build fewer large plants as opposed to a number of smaller ones. Therefore, the Phillips plant at Site M would be required to recover 97.4 per cent of the sulphur in the inlet stream.

The Board believes a sulphur recovery level of 97.4 per cent could be achieved with the proposed facilities, so it would not require tail-gas clean up. However, the question of how the required minimum sulphur recovery level is to be met would be left to the applicant, and it would have to use whatever equipment is necessary to accomplish the required recovery of a minimum of 97.4 per cent.

8.6 Gas Conservation and Efficiency of the Plant

Phillips stated that the plant would recover essentially 100 per cent of the hydrocarbons produced after fuel requirements had been met. Due to the dry nature of the gas, there would be no recovery of liquid hydrocarbon products. In addition, the applicant stated that it chose the Selexol gas-sweetening process over others because it was safe, energy efficient, required little water, and could be turned down to meet lower operating conditions.

The interveners did not comment on gas conservation and the efficiency of the plant other than with respect to sulphur recovery.

The Board is satisfied respecting the hydrocarbon conservation aspects of the proposed plant.

8.7 Sulphur Handling and Odours at the Plant Site

8.7.1 Views of the Applicant

Phillips stated that it would provide facilities for the handling and storage of liquid sulphur for a minimum of five days in case it was unable to ship the sulphur due to emergency situations. Normally, the sulphur would be transported by truck to another gas plant, or alternatively directly to a market. The applicant stated that odour associated with liquid sulphur loading would be minimized by de-gasifying the sulphur.

The applicant stated that SO_2 odours would not be present because the odour threshold for SO_2 is 3 ppm, and at no time would SO_2 concentrations in the ambient air exceed the maximum permissible ground-level concentration of 0.17 ppm on a one-hour average basis. It stated that local odours may be detectable in the immediate vicinity of the plant from minor leakages, vents, and spillages. However, it stated that most gas plant odours are associated with plants that recovery hydrocarbon liquids which would not be present at the proposed facility.

8.7.2 Views of the Interveners

Some interveners expressed concern about odours from operation of the plant, and from sulphur loading and trucking operations.

8.7.3 Views of the Board

The Board agrees that odours from gas processing facilities are usually detectable only in the immediate vicinity of the gas plant and does not believe odour would be a problem at the proposed facility. The Board notes that the sulphur would be de-gasified, and produced water, if any, and waste water would be disposed of to an approved disposal well. In addition, vapours from the low pressure dump tank would be vented to the incinerator stack. The Board believes that de-gasifying the sulphur from about 300 ppm to less than 50 ppm would eliminate most odours related to sulphur handling and transport.

The Board notes that while Phillips did not propose storage of solid sulphur at the plant site, other than during emergency situations, solid sulphur storage at the PanCanadian plant was specifically prohibited in the approval of the Minister of the Environment for that plant. The Board expects that, if he is prepared to approve the Phillips plant, the Minister may wish to condition his approval similarly for the Phillips plant.

8.8 Transportation of Sulphur

8.8.1 Views of the Applicant

As indicated in section 7, Phillips proposed to transport sulphur in liquid form by truck to another gas plant with sulphur storage capacity, or directly to market. It stated that the preferred route to truck sulphur from Site M is from the site to Highway 1A and then east on Highway 1A to the railhead at Wildcat Hills for possible further transport to Calgary or Crossfield. The alternatives to trucking from Site M would be to truck sulphur through the Morley Reserve to Highway 1 and then east to the railhead on Highway 1.

Phillips stated that a possible alternative to trucking the sulphur would be to use a liquid sulphur pipeline. However, it rejected the idea because the Stoney Band indicated that it would not approve the pipeline across the Reserve since the pipeline would be above ground and not aesthetically pleasing. Secondly, Phillips stated that there would be sulphur solidification and resultant plugging difficulties in operating a 32 to 48 km liquid sulphur pipeline. The applicant stated that the proposed operation would not be a place to try out new technology in liquid sulphur pipelines.

8.8.2 Views of the Interveners

The Village objected to the transport of sulphur by truck along Highway 1A and indicated that the sulphur should be transported through the Reserve to Highway 1. The majority of the interveners objected to sulphur trucks travelling along Highway 940 or Richards Road carrying sulphur from Sites PR1 and P1A.

Alberta Transportation submitted an intervention, under Section 26 of the Board's Rules of Practice, concerning the upgrading of Highway 940. The letter indicated that there are no provisions for capital improvements for the 23 km of Highway 940 between the Richards Road junction and Highway 1A in the forthcoming five-year program. The letter further stated that, if the development of a gas plant were to require road improvements, Alberta Transportation would consider sharing the cost of upgrading with the proponent of the gas processing project.

8.8.3 Views of the Board

The Board recognizes the concerns of the interveners regarding sulphur transportation by trucking, particularly respecting the alternative of using Highway 1 versus 1A. However, it has no jurisdiction in the matter.

In regard to transportation of sulphur by pipelines, the Board accepts that technical problems exist with current sulphur pipeline technology, and does not believe that it is a viable alternative in this case and at this time.

8.9 Water Control Measures

Phillips stated that surface run off holding ponds with surface oil skimming facilities would be installed. Discharge of the pond would occur once a year during spring run off. Phillips is prepared to de-gasify produced water in the unlikely event that it was produced and would dispose of it by deep well injection. Water supply for the plant would be taken from PanCanadian's water well.

In view of the nature of the proposed gas processing scheme and the measures adopted by the applicant, the Board considers the impact on the aquatic environment would be minimal.

8.10 Emergency Plans

Before the gas plant goes on stream, Phillips indicated that it would prepare an emergency procedures plan as a guide for personnel and contractors in responding quickly to an accident. It further stated that its gas wells have automatic downhole shut-off valves.

The Board notes that an emergency procedures and contingency plan would be required for review by the Board in accordance with section 9.060 of the Oil and Gas Conservation Regulations. These are plans to be followed in the event of an uncontrolled release of contaminants to air, water, or land, and with respect to sour gas processing plants, particularly the release of H_2S. The plans are reviewed by the Board for approval to ensure that they are comprehensive, well organized, up to date, and will ensure public safety. Such plans are routinely made available to the public.

8.11 Noise

The applicant indicated that noise would be most significant with development of Sites PR1 and P1A during construction only. Noise levels would not exceed 85 decibels on the A scale (dBA) in the process area and about 40 dBA at the plant gate and that the noise would be at a constant level. It stated that 40 dBA is below the maximum levels as set out in the Board's Interim Directive No. ID 80-2. Noise from flaring would depend on the volume of gas flared. Flaring noise would be audible above the noise level of the plant on occasion; however, Phillips did not believe the noise would be such as to bother anyone.

A number of the interveners operating trail rides, fitness and guest ranches expressed some concern about noise affecting their business ventures. Kings' Fold was very concerned about noise in relation to its proximity to Site P1A.

The Board believes that noise would not be a problem, given the processing capacity and design of the proposed gas plant, if its location is at Site M. In addition, the applicant must comply with the Board's noise guidelines set forth in Interim Directive No. ID 80-2 which limits maximum permissible noise levels to 65 dBA during the day and 50 dBA during the night measured in the direction of the source at a distance of 15 m from any occupied permanent dwelling. If problems respecting noise were to occur, the Board's area office located in Turner Valley should be contacted to respond to complaints.

8.12 Feasibility of Pipeline Routes

8.12.1 Views of the Applicant

The applicant showed pipeline routes from the gas wells to Site M following corridors across the disputed Crown lands and the Stoney Reserve. These corridors are those which were available for lease by PanCanadian. There is a legal question as to whether these corridors are still available for leasing by the applicant. From Site M the sales gas line would follow the same route as the existing sales gas line from the PanCanadian plant.

The applicant assured McDougall Ranch that the soil survey maps constructed for the environmental impact assessment report do not indicate pipeline corridors.

As sites for the future compressor installations have not been chosen, the applicant stated that it was unable to decide on the type of fuel, that is, gas or electricity, to be used for the compressors. Therefore, the need for fuel gas pipelines for compressors was not certain.

8.12.2 Views of the Board

The Board notes that none of the interveners expressed concerns about the proposed pipeline routes, and believes that there is no major obstacle preventing the connection of the wells to Site M and the subsequent delivery of sales gas to market.

9 SPECIAL FLARING CONSIDERATION

In view of the concern expressed by the interveners at the hearing, the Board has reviewed the circumstances surrounding flaring periods that occur at gas plants from time to time. Having regard for the reasons for flaring, the Board believes Phillips can schedule turnaround and scheduled shutdown or maintenance periods ahead of time in order to limit flaring to daylight hours, except during emergencies. The Board would add such conditions to any approval issued.

10 DECISION

Having considered all of the evidence, the Board finds that the proposed plant is in the public interest and is prepared to approve the application by Phillips for a new gas plant to be located at Site M, in the NE¼ of 2-26-7 W5M.

The Board will issue the required approval on receipt of the necessary approval of the Minister of the Environment and will include in the approval the special conditions referred to in this Decision Report.

ISSUED at Calgary, Alberta on 26 June 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy, P.Eng.
Vice Chairman

N Strom

N. Strom, P.Eng.
Board Member

Dr. R. S. Weaver
Acting Board Member

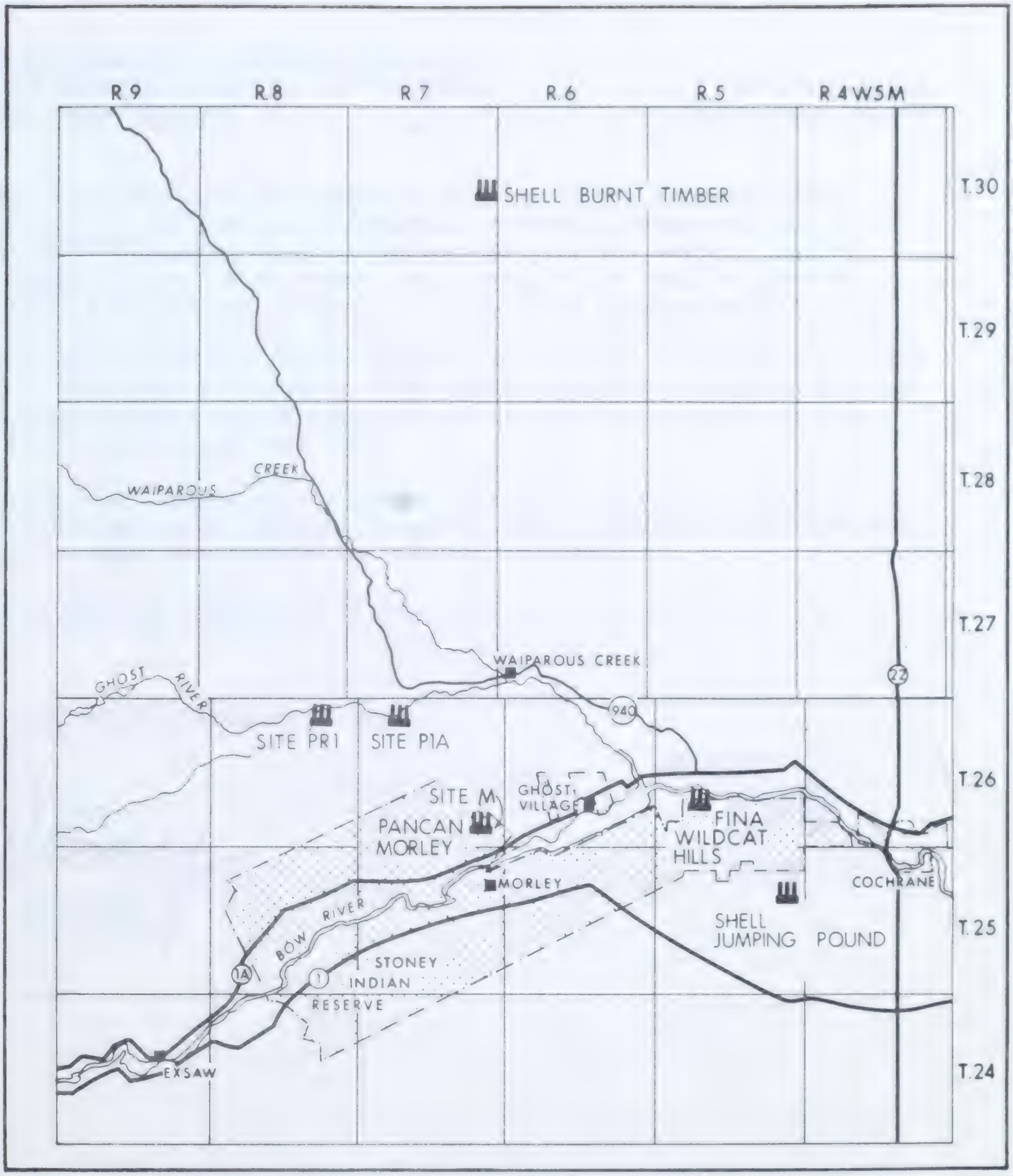

FIGURE 1 MORLEY – GHOST RIVER AREA

LOCATIONS OF EXISTING GAS PLANTS
AND PHILLIP'S PROPOSED ALTERNATIVE
PLANT LOCATIONS.

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

CANADIAN OCCIDENTAL PETROLEUM LTD. ET AL
COMMON PURCHASER, CARRIER, AND PROCESSOR
OKOTOKS CROSSFIELD POOL

Decision 81-13
Application 800939

The Board has reviewed the report of its examiners, attached hereto, respecting the application of Canadian Occidental Petroleum Ltd. et al for an order declaring Canadian Western Natural Gas Company Limited and Cominco Limited to be common purchasers of gas from the Okotoks Crossfield Pool and has adopted the reasons and recommendations of the examiners for the purposes of its decision. The Board, therefore, with the approval of the Lieutenant Governor in Council, is prepared to issue an order effective 26 November 1980, declaring Canadian Western Natural Gas Company Limited and Cominco Limited as common purchasers of gas from the Okotoks Crossfield Pool.

The Board will dispose of the common carrier and processor portions of the application on or after 31 December 1981 if the applicants have not applied by that time to have the hearing re-opened.

DATED at Calgary, Alberta on 12 June 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy
Vice Chairman

Attachment

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

CANADIAN OCCIDENTAL PETROLEUM LTD., J.M. HUBER
CORPORATION, AND BEARCAT EXPLORATIONS LTD.
COMMON PURCHASER, CARRIER AND PROCESSOR
OKOTOKS CROSSFIELD POOL

Examiners' Report E 81-14
Application 800939

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1 INTRODUCTION

1.1 Application

Canadian Occidental Petroleum Ltd., J.M. Huber Corporation, and Bearcat Explorations Ltd. (the applicants), applied pursuant to sections 49, 52, and 54 of The Oil and Gas Conservation Act (the Act) for an order declaring

- Canadian Western Natural Gas Company Limited and Cominco Limited to be common purchasers of gas from the Okotoks Crossfield Pool,
- Texasgulf Inc. to be a common carrier of gas in the Okotoks Crossfield Pool, and
- Texasgulf Inc. to be a common processor of gas produced from the Okotoks Crossfield Pool.

At the time of the hearing, and pursuant to section 56.1 of the Act, the applicants applied to have 7 November 1980 specified as the effective date of the common purchaser order.

1.2 Hearing

The application was considered at a public hearing on 31 March 1981 in Calgary, Alberta, by Board-appointed examiners H. J. Webber, P.Eng., L. A. Bellows, P.Eng., and M. J. Bruni.

Texasgulf Inc., Canadian Western Natural Gas Company Limited on behalf of itself and Cominco Limited (Cominco), and Mitchell Energy Corporation submitted interventions. Amerada Minerals Corporation of Canada Ltd. and BP Exploration Canada Limited intervened for the purposes of cross-examination and argument.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Canadian Occidental Petroleum Ltd. A. L. McLarty	G. S. Horne, P.Eng. G. D. Simpson, P.Eng.
Texasgulf Inc. (Texasgulf) D. B. McLaws, Q.C.	S. W. Odut, P.Eng. E. Q. Plum, P.Eng.
Canadian Western Natural Gas Company Limited (CWNG) C. K. Sheard	W. A. McPhee, P.Eng.
Mitchell Energy Corporation (Mitchell) R. M. Wilkinson	D. Hartman, P.Geol. B. Fisher, P.Eng.
Amerada Minerals Corporation of Canada Ltd. J. E. Almrud	
BP Exploration Canada Limited C. T. Hyde	
Energy Resources Conservation Board Staff W. A. MacDonald, P.Eng. T. R. Keelan	

1.3 Background

The applicants finished drilling the well, Cdn Oxy et al Okotoks 11-17-20-28 (11-17 well), on 14 December 1979. The well was completed in the Crossfield Formation on 13 February 1980, and a subsequent flow test established that the well was capable of production.

The Okotoks Crossfield Pool (the pool) is a shallow marine shelf deposit consisting of porous secondary dolomite. As is common in carbonate reservoirs, the permeability varies considerably throughout the pool. The produced gas contains about 34 per cent hydrogen sulphide (H_2S) and 11 per cent carbon dioxide.

The high H_2S content is particularly important, considering the close proximity of the pool to urban and residential developments. Landowners in the Okotoks area have expressed concerns about the proliferation of sour gas facilities and the adverse effects the facilities will have on residential development. In part, because of the increasing number of interventions which were being submitted at Board hearings related to sour gas facilities in the Okotoks area, the Board became aware of conflicts between industry and landowners in the area. Recognizing the need for a co-ordinated development plan, the Board issued Informational Letter IL 80-4 requesting that oil and gas developers in the area prepare such a plan. Recently the Board issued Informational Letter IL 81-7, outlining its views on the future development of the sour gas reserves in the Okotoks area. A copy of IL 81-7 is included as Appendix A to this report.

1.4 Preliminary Matter

Prior to the applicants' presentation of their application, Texasgulf informed the examiners that it was willing to transport and process the applicants' gas, provided the Board would indicate that this would not be in contravention of the Board's wishes as set down in IL 81-7.

In response to Texasgulf's statement, the applicants requested that the examiners adjourn the hearing sine die with respect to the common carrier and common processor portions of the application. They further requested that the examiners seek and provide an early indication of the Board's view, in light of IL 81-7, respecting the acceptability of the movement of the gas from the 11-17 well to the Texasgulf plant through a proposed pipeline and a portion of the existing pipeline system.

The examiners adjourned the hearing sine die with respect to the common carrier and processor portions of the application for the purpose of obtaining the Board's position regarding the condition set out in Texasgulf's statement. On 8 May 1981, the Board advised the applicants by letter that processing the gas from the 11-17 well through the Texasgulf plant at this time would not be contrary to the general intent of IL 81-7. The applicants informed the Board that negotiations are proceeding and depending on the results, they will apply to the Board to either withdraw or proceed with the common carrier and processor applications.

The examiners believe it inappropriate for the adjournment to extend indefinitely, and propose that the Board dispose of the common carrier and processor portions of the application on or after 31 December 1981, if the applicants have not applied by that time to have the hearing reopened.

2 ISSUES

The examiners find that the remaining issues related to this application are

- the need for a common purchaser order, and
- if such an order is found to be required, the effective date of the common purchaser order.

3 NEED FOR A COMMON PURCHASER ORDER

3.1 Views of the Applicants

As evidence that the 11-17 well is within the pool, the applicants submitted Texasgulf's net pay isopach of the pool, which was included in

Texasgulf's April 1980 Overall Development Plan for the Okotoks Area. This isopach clearly shows section 17-20-28 W4M (section 17), which contains the applicants' 11-17 well, to be entirely within the pool. In addition, a log cross-section and a structure map of the Crossfield Formation were submitted to demonstrate the continuity of the Crossfield Formation throughout the area in and near section 17.

To support their belief that drainage has occurred and is occurring from the reserves underlying section 17, the applicants presented the results of one static-gradient pressure test and one surface-pressure measurement conducted on the 11-17 well. The former, taken in February 1980, indicated a bottom-hole pressure of 21 170 kPa, some 3650 kPa lower than the initial pool pressure of 24 820 kPa. The surface measurement was taken in February 1981, and gave a wellhead pressure of 12 491, which is 197 kPa lower than the February 1980 wellhead pressure of 12 688 kPa. The applicants estimated that 50×10^6 m^3 of raw natural gas had been drained from the reserves underlying section 17 as of February 1980.

The applicants submitted that they were unsuccessful in obtaining a gas purchase contract with either CWNG or Cominco, presently the only purchasers of gas from the pool. Pan-Alberta Gas Ltd. (Pan-Alberta) has contracted to purchase the applicants' gas but deliveries are not expected to commence before November 1983. TransCanada PipeLines Limited and ProGas Limited had also indicated that they would not purchase gas from the Okotoks area. The applicants concluded that the only alternative available to them to prevent further drainage from the reserves underlying section 17 was to seek a common purchaser order.

The applicants stated they would have no objection if the Board were to stipulate that the common purchaser order would be outstanding only until the applicants' contract with Pan-Alberta became effective.

3.2 Views of Texasgulf

Texasgulf did not dispute that the 11-17 well was within the pool. However, it submitted that the drainage rate from the reserves underlying section 17 is not large enough to warrant a common purchaser order.

Although Texasgulf agreed that drainage was and is being caused by production from Texasgulf wells and the wells of other producers in the pool, it contended that the application should be denied because a common purchaser order would merely be a stopgap until the applicants' Pan-Alberta contract became effective. Texasgulf also pointed out that when the Pan-Alberta contract became effective, the applicants would have an unfair advantage over other producers in the pool in that they would have an additional purchaser of their gas.

3.3 Views of Mitchell

Mitchell supported the common purchaser application and presented its interpretation of the pressure drop in the southern portion of the pool which indicates that gas was and is being drained from the southern portion of the pool to the producing wells in the central part of the pool. Mitchell submitted that this drainage is having a significant impact on its gas reserves, while residential development is impairing the orderly development and depletion of the field.

Mitchell opposed the proposal that the common purchaser order be outstanding only until the applicants' contract with Pan-Alberta becomes effective. It argued that this would not solve the problems of other operators in the pool who have been unable to sell their gas and whose non-producing lands are being drained.

3.4 Views of CWNG and Cominco

CWNG and Cominco had no objection to being declared common purchasers if, pursuant to section 52(5) of the Act, they are not required to purchase a greater amount of gas, or gas at a greater rate than was being taken prior to the declaration of common purchaser.

3.5 Views of the Examiners

The examiners agree that the 11-17 well is completed within the pool and is capable of producing at commercial rates, and note that neither of these points was disputed by the interveners.

The examiners believe the submitted pressure data indicates significant gas drainage from section 17 (and other non-producing lands), and that the drainage would continue if the current production pattern in the pool were to persist.

The examiners are satisfied that the applicants have made reasonable attempts to sell their gas to potential gas purchasers and were unsuccessful in the near term. Although the applicants do have a conditional contract for the sale of their gas to Pan-Alberta, the examiners believe that this contract will not become effective for at least two years.

The examiners conclude that declaration of the current purchasers in the pool as common purchasers is required to ensure that the applicants have the opportunity to commence marketing their gas before further drainage occurs from their reserves underlying section 17. The examiners do not believe it is desirable to stipulate that the order expire when the applicants' contract with Pan-Alberta becomes effective. This would not alleviate any inequitable situation which may face operators in the pool who may be unable to market their gas.

4 EFFECTIVE DATE OF THE COMMON PURCHASER ORDER

4.1 Views of the Applicants

The applicants requested that the common purchaser order be made effective as of 7 November 1980, the date of application. They submitted that section 56.1 of the Act was introduced to ensure that a successful applicant would not be penalized during the months of delay between the time of application and the issuance of the common purchaser order.

The applicants maintained that even if the order were made retroactive to the date of application, they would be additionally required to show that an offer for the sale of their gas had been made to the common purchasers.

The applicants stated that in the past, the Board has indicated a pipeline must be constructed such that the producer is physically able to deliver his gas before an offer for the sale of his gas can be considered valid. The applicants submitted that in this case there are several reasons why such a requirement is arguable. They suggested the estimated capital investment of $1,381,000 needed to construct the pipeline, coupled with the lack of certainty on the outcome of the application, represented a substantial risk. In addition, Alberta Environment would only allow the pipeline crossings on the Highwood and Sheep Rivers to be constructed during certain periods of the year. The applicants argued that, for these reasons, it should not be necessary that the pipeline be built before an offer for the sale of their gas could be considered valid.

The applicants stated that, should the Board decide not to grant the retroactivity, they would have no opportunity to argue, if need be in a court of law, their interpretation of what constitutes an offer for sale.

4.2 Views of Texasgulf

Texasgulf was opposed to the applicants' request that any common purchaser order resulting from the application be retroactive to 7 November 1980. Texasgulf maintained that it would not be in the spirit of section 56.1 if the applicants were able to be credited in gas sales for a period of time during which they were physically unable to deliver the gas. It submitted that the applicants were given approval by the Board in November 1979 to build the pipeline, but until the last month or six weeks prior to the hearing, had taken no steps towards construction of that pipeline.

Texasgulf suggested that the common purchaser order should be effective only from the date when the applicants' well is able to produce and deliver gas to the purchasers.

4.3 Views of CWNG and Cominco

CWNG and Cominco also opposed the applicants' request for retroactivity. They submitted that the Board has the discretion to make the order retroactive to the date of the application, provided that an offer to sell gas has been made. However, in their view, no offer for sale had been made since the gas was incapable of being delivered. They disagreed with the applicants' proposal that the Board make the order effective to the date of application, and thereafter let the courts decide what constitutes an offer for sale. They suggested that it is the Board's duty to assess what is the fair, effective date; previous Board policy dictates that this date should be the time at which the gas could be delivered.

4.4 Views of the Examiners

In exercising the discretion set out in section 56.1 of the Act, it is necessary that regard be given to fairness, conduct of the parties, and the impact of the effective date on the participants.

While the applicants have contacted CWNG in an attempt to acquire a gas purchasing agreement with respect to CWNG and Cominco, they have not constructed a pipeline from the well to the tie-in point and, therefore, are not ready to deliver gas. However, it is the opinion of the examiners that in this particular case it is unreasonable to expect the applicants to have constructed the pipeline, considering

- the large capital expenditure required, particularly in view of the requirement that the line be sized to serve future wells which may be completed in the vicinity,
- the rapid encroachment of residential development in the Okotoks area which has prompted the Board to issue two informational letters concerning future development of sour gas reserves and has resulted in a high degree of uncertainty as to the outcome of the common purchaser application, and
- the time limitation imposed by Alberta Environment on the construction of the pipeline crossings on the Highwood and Sheep Rivers.

Keeping in mind the foregoing and that

- section 56.1 of the Act clearly indicates the effective date of an order cannot be previous to the date on which the application for the declaration was made,
- the applicants did contact CWNG in an effort to obtain a gas purchase contract prior to the date of application, and
- the applicants have suffered at least six months of drainage since the application was made to the Board,

the examiners conclude that the effective date of the common purchaser order should be 26 November 1980, the date upon which the application was made.

5 RECOMMENDATIONS

The examiners recommend that

- the Board, with the approval of the Lieutenant Governor in Council, issue an order declaring Canadian Western Natural Gas Company Limited and Cominco Limited to be common purchasers of gas produced from the Okotoks Crossfield Pool,

- the order specify 26 November 1980 as the effective date of the common purchaser declaration, and
- the Board dispose of the common carrier and processor portions of the application on or after 31 December 1981 if the applicants have not applied by that time to have the hearing reopened.

DATED at Calgary, Alberta, on 10 June 1981.

H. J. Webber

H. J. Webber, P.Eng.

L A Bellows

L. A. Bellows, P.Eng.

M. J. Bruni

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

APPLICATION BY DOME PETROLEUM LIMITED TO REINSTATE WELL LICENCES NO. 88870 AND 89046

Decision 81-15
Application 810196

1 INTRODUCTION

1.1 Background

On 6 February 1981, Dome Petroleum Limited (Dome) applied to the Energy Resources Conservation Board (the Board) for a well licence to drill DOME VIKING-KINSELLA 4-26-48-8 (Viking-Kinsella 4-26) located in Legal Subdivision 4 of Section 26, Township 48, Range 8, West of the 4th Meridian, for the purpose of obtaining oil production from the Colony Sand. On 17 February 1981, it also applied for a licence to drill DOME WILDMERE 16-8-48-6 (Wildmere 16-8) located at Legal Subdivision 16 of Section 8, Township 48, Range 6, West of the 4th Meridian, for the purpose of obtaining oil production from the Colony or Lloydminster Sand. In each application, the applicant indicated that it had the right to drill for oil and gas in the section down to and including the terminating zone. The Board issued Well Licence No. 88870 for the Viking-Kinsella 4-26 well on 9 February 1981 and Well Licence No. 89046 for the Wildmere 16-8 well on 18 February 1981.

The Board subsequently received letters from Hudson's Bay Oil and Gas Company Limited (Hudson's Bay) dated 19 February 1981 and 20 February 1981. In its letter of 19 February 1981, respecting the proposed Dome Viking-Kinsella 4-26 well and the section in which it would be located, Hudson's Bay indicated that it was the lessee of the P&NG rights, it had a well in the section which was producing from the Colony Sand, and that Dome was not entitled to take production from or above the Colony Sand. The letter of 20 February 1981 indicated that Hudson's Bay was the lessee of the petroleum and natural gas rights underlying Section 8, Township 48, Range 6, West of the 4th Meridian, and that it had a well on that section which was producing from the Lloydminster zone. It further suggested that Dome did not have the right to produce from or above the Lloydminster Sand in the section. In both cases, Hudson's Bay requested that the Board suspend the Dome licences to prevent production being taken from or above the Colony and Lloydminster Sands respectively. On 24 February 1981, the Board advised Dome that well Licences No. 88870 and 89046 were suspended indefinitely pursuant to section 31(a) of The Oil and Gas Conservation Act (herein referred to as "the Act").

1.2 The Application and The Hearing

Dome applied pursuant to section 41(1) of The Energy Resources Conservation Act for a hearing respecting the Board's decision to suspend the licences for the two wells.

A public hearing of the application was held on 2 April 1981 before V. E. Bohme, P.Eng., G. A. Warne, P.Eng., and R. G. Evans, P.Eng.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Dome Petroleum Limited (Dome) A. L. McLarty	J. M. Barclay
Hudson's Bay Oil and Gas Company Limited (Hudson's Bay) M. V. McDill Mrs. L. Fryers	W. DeBoni, P.Eng. C. W. Fischer, P.Eng. J. J. Brown
Globe Oil Co. (1958) Ltd. (Globe) J. Petch	R. Spence, P.Eng. J. Ross
Energy Resources Conservation Board staff K. F. Miller G. D. Agnew N. K. Shtand	

2 ISSUES

The Board believes the significant issues relating to the application to be

(1) whether it has been made to appear to the Board that The Oil and Gas Conservation Act has been contravened by Dome,

(2) whether the Board should have suspended the licences for the Wildmere 16-8 and Viking-Kinsella 4-26 wells, and

(3) whether the suspensions should be continued or revoked.

3 CONSIDERATION OF THE APPLICATION

3.1 Applicant's Views

Dome suggested that the legal issue raised by the suspension of the well licences is whether, pursuant to section 31(c) of the Act, a contravention of the Act had occurred and whether Dome was a person who has, within the meaning of section 25 of the Act, the right to produce oil and gas from the zones or formations into which the wells were to be drilled. Dome claimed that it had such right. Dome based its claim on an agreement between Hudson's Bay and Seibens Oil and Gas Limited (Seibens), (Dome being Seibens successor to the agreement), dated the 1st day of May, 1974.

The Board was told that pursuant to the agreement, mineral rights (hereinafter referred to as "rights") owned by Dome, as successor to Seibens, were to be leased by way of petroleum and natural gas leases to Hudson's Bay after compliance with certain terms of the agreement. The Board was further advised that the agreement contained a clause (clause 2.11) whereby rights obtained by Hudson's Bay under the agreement would have to be surrendered (with some exclusions in certain cases) to Dome. It was argued that, based on the agreement and the documentary evidence presented to the Board, Dome had complied with clause 2.11 of the agreement and that Hudson's Bay was obliged to surrender to Dome any rights it held to lands which would be affected by clause 2.11, and in particular the two sections on which the proposed wells were to be drilled.

Dome cited section 108 of the Act to suggest that the Board had exclusive jurisdiction to determine the ownership of mineral rights for the purposes of well licensing.

Dome said that section 25 of the Act had not been contravened because Dome was entitled to the rights to produce oil and gas. Dome stated that the onus to show that it did not have these rights was on Hudson's Bay, pursuant to section 25(2) of the Act and that Hudson's Bay had not discharged that onus. It was suggested by Dome that the best position Hudson's Bay could hope to establish before the Board was that a question of ownership of the mineral rights exists and Dome went on to suggest that merely raising that question in the Board's mind does not constitute a contravention under section 31(a).

Dome referred to the suggestion of Hudson's Bay that the onus was on Dome to prove, pursuant to section 25(3) of the Act, that it had the right to recover the oil and gas in the two sections. Dome stated that section 25(3) of the Act, whereby the Board may require a licensee to prove it has the rights to produce, did not apply in this case, because the Board did not follow the procedure of that section, and that accordingly, there was no onus on Dome to prove it had the rights.

In summary, Dome suggested that the suspension of the well licences should not be continued.

3.2 View of Hudson's Bay

Hudson's Bay stated that it had completed a well in Lsd 10 of Section 8, Township 48, Range 6, West of the 4th Meridian, in the Lloydminster zone. Hudson's Bay further stated that it had farmed out the southeast quarter and the west half of Section 26, Township 48, Range 8, West of the 4th Meridian, to Globe Oil Co. Ltd. (Globe) which had drilled a well in Lsd 7 of that section. Hudson's Bay did not dispute the fact that Dome, as successor to Seibens, owns the mineral rights underlying the two sections. Hudson's Bay claimed it held the petroleum and natural gas leases for those two sections, and that Dome did not have the right to produce from any zone up-hole of and including a zone from which Hudson's Bay, or anyone on its behalf, was producing.

Hudson's Bay took the position that Dome's claim of its right to produce the minerals under Section 26-48-8 W4M and Section 8-48-6 W4M involves a question of law which the Board had no jurisdiction to determine. In conclusion, Hudson's Bay stated that for the subject licensed wells, Dome can produce only from below the zones from which Hudson's Bay is producing and it is not entitled to production from any zone above the base of these producing zones.

3.3 Views of Globe

Globe claimed an interest in Section 26-48-8 W4M by way of a farm-out agreement from Hudson's Bay Oil and Gas Company Limited. It had drilled a well to the Colony Formation in Lsd 7 of Section 26. Globe took the position that the question of entitlement to production is one that should be put before a court. Globe stated that the evidence indicated that there is a petroleum and natural gas lease in favour of Hudson's Bay from which Globe derives its interest. It suggested that the licence for the Viking-Kinsella 4-26 well, to the extent that it would affect any zones above the bottom of Globe's well in Lsd 7-26, should remain suspended.

3.4 Board's Views

The Board accepts the evidence of the parties that there is an agreement between Hudson's Bay and Dome, as successor to Seibens, which governs the rights of Hudson's Bay and Dome to the petroleum and natural gas in Sections 26-48-8 W4M and 8-48-6 W4M. The Board recognizes that pursuant to the agreement, where the terms of the agreement have been complied with, Dome may be entitled to a surrender of petroleum and natural gas rights from Hudson's Bay. The Board notes that where there is a surrender of rights by Hudson's Bay to Dome, Hudson's Bay may, in certain circumstances, retain rights to certain zones.

The Board, having reviewed the evidence presented and having reviewed the agreement, believes that the evidence before it is insufficient to allow the Board to make a determination regarding ownership. Further, the Board believes that it would be more appropriate that the agreement between Hudson's Bay and Dome should be interpreted as to ownership by a court of law.

The Board does not accept Dome's argument that the onus is on Hudson's Bay to prove that Dome is not entitled to recover the oil and gas underlying Sections 26-48-8 W4M and 8-48-6 W4M. Dome's interpretation of section 31(a) of the Act suggests that a contravention must be shown to have occurred. Section 31(a) provides as follows:

> "31 The Board may
>
> (a) cancel a licence or suspend a licence for a definite time or indefinitely if it is made to appear to the Board that a contravention of this Act, the regulations or an order of the Board has occurred with respect to the well for which the licence was granted", (emphasis added)

The Board notes that the key phrase in this section is "if it is made to appear". Section 25(1)(a) provides:

> "25 (1) No person shall apply for a licence
>
> (a) for a well for the recovery of oil or gas from a drilling spacing unit,
>
> unless he is entitled, or is the authorized representative of the person who is entitled, to the right to produce the oil, gas or crude bitumen for the recovery or evaluation for which the well is to be drilled."

Having regard to the prohibition contained in section 25; if a licensee has obtained a well licence and if it is made to appear that it does not have the right to recover oil and gas in the drilling spacing unit, then the Board may invoke section 31(a) because it appears to the Board that a contravention of section 25 of the Act has occurred. The party alleging that a licensee does not have the right to produce oil and gas from a drilling spacing unit need not prove that allegation but only make it appear that a licensee does not have the right.

Based on the evidence before it, the Board is not able to conclude that Dome has the right to produce the oil and gas from all zones underlying Sections 26-48-8 W4M and 8-48-6 W4M. However, the Board notes that there is no dispute with respect to any zone below that in which Hudson's Bay has completed a well capable of production within the lands affected by the agreement.

4 FINDINGS

4.1 Since the right of Dome to produce the oil and gas from certain zones underlying Section 26-48-8 W4M and Section 8-48-6 W4M is in doubt, it has been made to appear to the Board that, in applying for a licence to drill and produce from these zones, Dome has contravened section 25(1)(a) of the Act.

4.2 The Board confirms that it was appropriate, under the provisions of section 31(a) of the Act, to suspend well licences numbered 88870 and 89046.

4.3 The suspension should continue until the Board is satisfied as to who has the right to produce the oil and gas underlying Section 26-48-8 W4M and Section 8-48-6 W4M.

5 DECISION

The suspension of well licences numbered 88870 and 89046 shall continue until the question of who has the right to produce the oil and gas from the disputed zones underlying Sections 26-48-8 W4M and 8-48-6 W4M has been resolved.

DATED at Calgary, Alberta, on this 8th day of July, 1981.

ENERGY RESOURCES CONSERVATION BOARD

V E Bohme

V. E. Bohme
Board Member

G. A. Warne

G. A. Warne
Acting Board Member

R G Evans

R. G. Evans
Acting Board Member

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

NOVA, AN ALBERTA CORPORATION
AND SHELL CANADA LIMITED
INDUSTRIAL DEVELOPMENT PERMIT TO
MANUFACTURE POLYETHYLENE

Decision 81-16
Application 800910

1 INTRODUCTION

NOVA, AN ALBERTA CORPORATION (NOVA) and Shell Canada Limited (Shell) (as a joint-venture company hereinafter referred to as NOVA/Shell) applied, pursuant to section 42, subsection (2) of The Oil and Gas Conservation Act (Act) for an industrial development permit which would authorize the use of ethylene as feedstock and gas as fuel in the manufacture of polyethylene. NOVA/Shell proposed to construct a linear-low-density polyethylene plant on the site of an existing ethylene plant owned by The Alberta Gas Ethylene Company Ltd. (AGEC), approximately 19 kilometres (km) east of Red Deer.

1.1 Background

Since the latter part of 1979, AGEC has operated an ethylene manufacturing plant on the site proposed for the NOVA/Shell plant, under Industrial Development Permit No. AGE 76-1. The site is shown on a map in Appendix C. A second ethylene unit for the site was applied for by AGEC and subsequently approved with the issuance of Industrial Development Permit No. AGE 79-2, on 12 March 1981. This facility is expected to start producing ethylene in 1984. A third ethylene unit, also on the same site, was applied for by AGEC in an application dated 27 October 1980. A hearing respecting the third unit was held by the Board in Red Deer on 7 and 8 April 1981. Board Decision 81-10[1] deals with the third ethylene unit and indicates that the Board, subject to authorization by the Lieutenant Governor in Council, is prepared to issue a permit for the unit.

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[1] The Alberta Gas Ethylene Company Ltd., Industrial Development Permit To Manufacture Ethylene, ERCB Decision Report 81-10, June 1981.

The application of NOVA/Shell respecting the use of ethylene and gas to manufacture polyethylene was originally scheduled to be heard at the conclusion of proceedings respecting the third AGEC ethylene unit. At the request of an intervener, the NOVA/Shell hearing was deferred until 28 April 1981. This report deals with the NOVA/Shell polyethylene project proposal.

1.2 Hearing

A public hearing of the application was held in Red Deer, Alberta, on 28 April 1981, with G. J. DeSorcy, P.Eng., N. Strom, P.Eng., H. J. Webber, P.Eng., and Dr. A. O. Olson, sitting. Dr. Olson is an Assistant Deputy Minister of the Department of Agriculture, and was appointed Acting Board Member for purposes of dealing with the subject application.

Those who appeared at the hearing are listed in Appendix A, along with abbreviations used in this report.

2 APPLICATION

The industrial development permit applied for by NOVA/Shell would authorize the maximum annual use of 300 thousand tonnes of ethylene as feedstock and 10 million cubic metres of gas as fuel, to manufacture 310 thousand tonnes of polyethylene. The NOVA/Shell joint-venture company would be headquartered in Alberta, and would manufacture and sell petrochemical derivatives in Canadian and international markets. NOVA stated that it is an independent company with approximately 94.6 per cent Canadian ownership, and Shell stated that it is an integrated company carrying on business under the Canada Business Corporation Act, with about 21.5 per cent Canadian ownership.

The proposed plant would use a proprietary process designed to use ethylene and one or more comonomers to produce polyethylene at low pressure without the need of hydrocarbon solvents. The monomers and certain proprietary catalysts would be fed continuously to a fluidized bed reactor, and product would be removed intermittently by a discharge system. Impurities would be removed from the reactor feed streams to ensure efficient performance of the catalysts. The product would be conveyed through purge vessels to holding tanks for blending, formulation, and packaging as required. Bulk rail hopper cars and rail car containers would be used as the primary methods of product shipment, with provision for truck deliveries as required. NOVA/Shell stated that it would expect to obtain all of its ethylene feedstock requirements from AGEC on a take-or-pay[2], cost-of-service basis. The proposed NOVA/Shell plant would require increasing amounts of ethylene between the time of its projected start-up in 1984, and the period of expected full-scale operation between 1986 and 2004. The applicant stated that the plant would operate at 75 per cent of nominal design capacity in 1985, and that it expected production to exceed nominal design capacity by approximately 15 per cent in later years. NOVA/Shell stated that the increase over nominal design capacity would result from developments in the newer process technology which would be utilized in the proposed plant. The fuel gas requirements requested by NOVA/Shell were also increased to reflect the expected maximum annual production rates. NOVA/Shell stated that the plant's fuel gas requirements, to be purchased at prevailing market prices for consumption within the province, would be transported through the existing AGEC ethylene plant supply system, and that the anticipated normal electric power requirement of 9.5 megawatts would be obtained from Calgary Power Ltd. The applicant stated that, under normal operating conditions, it would purchase 73 cubic metres of water per hour from AGEC through the existing ethylene plant site water system. Comonomer supplies, the equivalent of less than 10 per cent of plant feedstock would, according to the applicant, be purchased in Canada or the U.S.A. and transported to the site in rail tank cars.

NOVA/Shell stated that the product which would be produced by the proposed facilities is a new type of low-density polyethylene for which markets are expanding. The applicant stated that it intends to supply Canadian markets with high quality, competitive polyethylene resins at competitive prices, and that it is satisfied that adequate long-term export markets are available for the product.

The applicant stated that its intention would be to design, construct, and operate the proposed plant in compliance with all provincial environmental regulations.

NOVA/Shell requested that the permit be issued for a term of 20 years, commencing with plant start-up projected for the second-quarter of 1984.

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[2] An agreement whereby payment must be made for a certain minimum quantity of an item being purchased, whether or not delivery of the minimum quantity is actually taken by the purchaser. The agreement usually includes provision for the purchaser to take delivery at a later date without further payment.

3 GENERAL POSITION OF INTERVENERS

Several interveners expressed concern repecting the use of land having good agricultural capacity for industrial and accompanying urban development. They were AIA, F.E.M. Farms, J. W. Hainsworth, the Commission, and PAL. A letter of intervention expressing a similar concern was submitted by the Federation of Alberta Naturalists, Land Use Committee, but no evidence was presented. The Stettler and District Economic Development Board presented a written submission but did not appear at the hearing.

In closing argument, AEC/Esso stated that, on a comparative basis, the polyethylene project proposal of NOVA/Shell offered less economic benefit to Alberta than the AEC/Esso styrene manufacturing proposal which has already received Board approval. AEC/Esso did not oppose the application, but urged the Board to have regard for the relative economic benefit to Alberta of each proposal, since both projects require ethylene which AEC/Esso stated is in short supply.

In closing argument, AEC/Du Pont stated that an application which it was about to file with the Board would offer significantly greater benefit to Alberta than the NOVA/Shell polyethylene proposal. Both proposals would require ethylene as feedstock. AEC/Du Pont stated that the public interest of Alberta required that no decision be made on the NOVA/Shell application until the Board has heard the AEC/Du Pont application.

DOW and Union Carbide submitted letters of intervention for the purposes of cross-examination and advancing of argument. Neither of these interveners presented evidence at the hearing.

4 ISSUES

The Board considers the issues respecting this application to be

(a) the availability of feedstock and fuel for the proposed plant, and the efficiency of energy resource use in the proposed plant,

(b) the environmental and social impacts of the proposed project,

(c) the location of the proposed plant with respect to land use, and

(d) the economic impact of the proposed project including manpower requirements, the degree of energy resource upgrading which would occur as a result of the project, the marketing of polyethylene, and potential for further upgrading.

5 AVAILABILITY AND EFFICIENT USE OF ENERGY RESOURCES

5.1 Availability of Fuel

The applicant proposed to use gas as fuel and is currently investigating a number of sources for the supply of its required volumes. NOVA/Shell undertook to advise the Board when arrangements for securing these supplies were concluded.

The Board believes that sufficient supplies of gas will be available in Alberta to meet the applicant's needs over the requested term of permit but would condition any permit issued that NOVA/Shell satisfy the Board, prior to plant start-up, as to the arrangements that had been completed for the required gas.

5.2 Availability of Feedstock

Views of the Applicant

The applicant expected that production from the proposed plant would exceed the nominal design capacity of 270 thousand tonnes per year by approximately 15 per cent and applied-for feedstock quantities based on this higher production rate.

NOVA/Shell submitted a letter from AGEC in which AGEC confirmed its intention to supply ethylene to the proposed plant from its Joffre complex and advised that sufficient supplies of ethylene would be available to satisfy the applicant's forecasted requirements. A contract for such a supply is awaiting approval of the Minister of Economic Development, as is required in conditions attached to the Order in Council approving AGEC's second ethylene plant.

The applicant did not foresee any problems respecting feedstock supply which would limit plant start-up or the continued operation of the proposed plant.

Views of the Interveners

In closing argument, AEC/Esso stated that the volume of ethylene required to satisfy projects already approved by the Board would clearly leave an inadequate supply from AGEC's second ethylene unit to meet the requirements of Union Carbide's proposed ethylene glycol project[3] and NOVA/Shell's proposed plant.

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[3] Application No. 800889 by Union Carbide, dated 22 October 1980, for an industrial development permit authorizing the use of ethylene and gas to manufacture ethylene glycol.

Views of the Board

The Board has reviewed future ethylene supply and demand in Alberta. In its evaluation, the Board included ethylene supplies which will be available from AGEC's third ethylene unit and made no allowance for ethylene volumes leaving the province. The Board recently indicated, in Decision 81-10, that it is prepared to approve the third ethylene unit, however, the authorization of the Lieutenant Governor has not yet been received. On the basis of its review, the Board is satisfied that sufficient supplies of ethylene will be available in Alberta to provide feedstock to all existing and approved ethylene upgrading facilities, as well as NOVA/Shell's proposed plant. The Board does note, however, that during the 1984-85 period, ethylene requirements in Alberta will likely approach projected supplies. Therefore, any delay in the projected start-up schedule of the planned ethylene-producing facilities could affect the commissioning date for plants which would depend on them for their ethylene feedstock. Also, the Board recognizes that there may be additional plans for the upgrading of ethylene within Alberta, for which industrial development permit applications have not yet been filed. Such projects, if they were to come forward and receive approval, would tighten the ethylene supply picture relative to demand.

As the Board believes that sufficient volumes of ethylene will be available in Alberta to satisfy demand, including NOVA/Shell's proposed use over the requested term of permit, it would be prepared, all other public interest matters being acceptable, to authorize the use of the applied-for ethylene volumes. However, as NOVA/Shell has not as yet contracted for its ethylene supply, the Board would condition any permit such that NOVA/Shell must satisfy it prior to plant start-up as to the arrangements it has made for its ethylene supply. Further, as the granting of an industrial development permit does not constitute an automatic allocation of resources, the Board takes the position that any risks associated with obtaining the required supplies of ethylene feedstock would be properly those of the permittees. The Board also notes that any contract contemplated by AGEC and NOVA/Shell for an ethylene supply from AGEC's second ethylene unit would require the approval of the Minister of Economic Development.

5.3 Efficient Use of Energy Resources

NOVA/Shell stated that it believes the proposed process to be the most energy- and feedstock-efficient linear-low-density polyethylene process in the world today.

The Board is satisfied that the proposed process represents up-to-date technology and would use gas and ethylene efficiently.

6 ENVIRONMENTAL AND SOCIAL IMPACT

Views of NOVA/Shell

NOVA/Shell submitted an environmental impact report which addressed the proposed polyethylene manufacturing facilities together with the currently-approved ethylene Units 1 and 2, and the applied-for ethylene Unit 3. The report became part of Application No. 800910.

With respect to air quality, NOVA/Shell stated that its proposed process would not employ routine vents to atmosphere. It stated that all hydrocarbon venting from purges, safety valves, and maintenance operations would be discharged through a flare system, and that by locating the plant adjacent to the AGEC ethylene plants, potential for the recovery of hydrocarbon purge streams would exist. The principal air contaminent from the plant would be oxides of nitrogen (NO_x) resulting from fuel combustion when and if utility generation for the plant became necessary. The NO_x emissions would, according to NOVA/Shell, be within allowable limits of The Clean Air Act. Fog generated by cooling towers would not result in traffic problems.

With respect to plant water requirements and aqueous emissions, NOVA/Shell stated that neither water withdrawal nor water discharge would result in a significant adverse impact on the Red Deer River. Water requirements would be taken from the Red Deer River and increase to about 3.5 times current levels, or about 1.9 per cent of annual mean flow, should the entire development, including three ethylene plants and the proposed polyethylene plant, be approved and put in operation. The requirements for the proposed polyethylene plant are relatively small, representing about 1/20 of the projected total of the three ethylene plants. Jointly with AGEC, NOVA/Shell would review the need for modifications to the effluent discharge structure to achieve mixing downstream of the effluent outfall. Effluent quantity and quality monitoring would continue.

With the exception of a small amount of water which would be used to cool product cutter blades in an optional operation, water would not come in contact with the process materials. NOVA/Shell stated that the effluent from this operation would be filtered prior to discharge into holding ponds.

With respect to noise, NOVA/Shell stated that its objectives would include maintenance or reduction of current noise levels throughout all phases of the planned development. Noise generated from start-up operations would be reduced by using centrally-located vent silencers and venting scheduling. Methods to reduce the need for steam blowing of lines are to be investigated, and flare noise would be reduced by a new flare tip design which is being planned for all flare stacks. The manifolding of flare stacks is being considered, so that output to flare during an emergency shutdown would be divided between two flare stacks.

Railcar shunting, which would have the most significant noise impact resulting from the proposed project, would be a frequent but sporadic occurrence limited to the daytime period betwen 7 a.m. and 7 p.m. NOVA/Shell stated that it would be prepared to consider reducing these hours of shunting operation if noise related to shunting became a problem.

Respecting employment, NOVA/Shell stated that construction employment benefits would be dispersed throughout the province with most construction workers being hired through unions in the Edmonton and Calgary regions which are major labour-recruiting centres. NOVA/Shell believed, however, that local benefits would be greater for the planned development construction phase than was the case with construction of the AGEC ethylene Unit 1, because some unions had established hiring halls in Red Deer. The overall effect of the proposed project in terms of employment would be indirect, with an expected increase in general economic activity in the area causing some local labour shortages. Local business, including farm operations in the Red Deer region, may encounter difficulties in obtaining labour. NOVA/Shell stated that approximately 35 to 40 per cent of new jobs which would be created by the proposed project would be filled by local residents.

Respecting community impact, the location of construction workers in on-site camps and the purchase of most materials and services outside the region would tend to minimize impacts of the construction phase on local communities. The construction camp would eliminate the need for most workers to travel to the site daily, although traffic on main roads would increase on weekends when workers would return home or travel to nearby communities. Although recreation facilities would be provided at the camp, workers would visit the communities and increase the demand on local recreation and entertainment facilities.

NOVA/Shell expected that 150 new operating and management personnel would be required for the proposed polyethylene plant. It stated that the area population would increase permanently as a result of the project, and that if vacancy rates were low when migration to the region increased, in-coming people would find it more difficult to obtain housing. No adverse effects on community utilities and services would be likely, provided that increased funding and manpower were made available as required.

Respecting traffic, NOVA/Shell stated that construction of the proposed polyethylene plant would result in a total of 15 rail loads of equipment being delivered to the site. Total rail traffic expected to result from the proposed polyethylene plant and three ethylene units would average 41 railcar movements per day during the operations phase. The site would be serviced by Canadian National Railways on a daily basis.

NOVA/Shell stated that road traffic generated by the construction phases of the two ethylene units and the polyethylene plant would be some 18 thousand truck loads. The presence of an on-site construction camp would eliminate the need for most workers to travel daily to the site. However, weekend traffic on main roads in the area would expectedly increase, as construction workers would probably return home or travel to nearby communities. The combined operations phases of the existing ethylene unit, two new ethylene units, and the polyethylene plant would generate approximately 320 vehicle trips per day. Secondary Highway 911, which extends east of Red Deer, is currently being upgraded to primary road status to accommodate traffic from Red Deer to industrial and resource developments in the area.

Views of the Interveners

PAL stated that the indirect effects of industrialization on the local farming community have not been predicted by NOVA/Shell, but that indirect effects would occur.

J. W. Hainsworth stated that, while the efficiency of expanding the AGEC site for a polyethylene facility was easy to see, the impact of the proposed expansion on the agricultural community was not as easily seen.

The Commission noted that increased noise due to petrochemical development in the Red Deer area has been of concern to some citizens, and it stated that monitoring of noise levels should be continued by appropriate agencies.

Views of the Board

With respect to the matters of air quality and water requirements and aqueous emissions, the Board is satisfied that adherence to all requirements of Alberta Environment and the Board would limit the impact of existing and proposed developments at the AGEC site to minimal and acceptable levels.

Regarding noise, the Board accepts the applicant's undertakings with respect to the use of improved flare tip silencers, the limiting of railcar shunting to normal daytime hours, and the possibility of further reductions in the hours during which shunting occurs if shunting results in a serious noise problem. The Board believes that these planned noise reduction measures, together with adherence to all other requirements of Alberta Environment and the Board, would result in acceptable noise levels in the area.

Respecting employment, the Board believes that while local farmers might experience some difficulties in obtaining farm labour at acceptable wage rates, the overall impact of the proposed project on employment opportunities for local residents would be beneficial.

With respect to community impact matters, the Board believes that a project of the scale proposed would likely result in some short-term problems during the peak construction phase, particularly in the area of public protection. Relative to the region, it expects that these would not be serious problems and could be dealt with as necessary by local authorities. The Board is satisfied that population growth related to the operating stage could be reasonably accommodated by the gradual expansion of housing, recreation facilities, transportation, law enforcement, and social services already available in the area. The Board strongly suggests that a community liaison committee involving all parties should be established to improve and maintain the working relationships of NOVA/Shell and other industrial operators in the area with the local community.

Respecting traffic, the Board recognizes the concerns expressed by several interveners that increased rail traffic could present a danger to local residents, especially at crossings along Secondary Road 597, but also near Joffre on Secondary Road 815. The Board believes that rail crossings should be improved as necessary but has no jurisdiction in this respect. It encourages the applicant to negotiate with the railway company, Alberta Transportation, the County of Lacombe and other involved parties towards this objective.

The Board also believes that the projected increase in road traffic, especially during the plant construction phases, would result in a modest lowering of general travel safety in the area, but notes that Secondary Road 911 is currently being upgraded to accommodate a major portion of the anticipated increases in road traffic.

7 LOCATION WITH RESPECT TO LAND USE

Views of NOVA/Shell

The site on which the proposed polyethylene plant would be located is in Sections 29, 31, and 32, Township 38, Range 25, West of the 4th Meridian. Appendix C to this report is a map showing the proposed site, which would be on the existing AGEC plant site near Joffre.

NOVA/Shell stated that the polyethylene facilities and related developments would require the rezoning for industrial use of an additional 100 hectares of land, but that no further rezoning of the proposed site would be applied for in future. It stated that the land would consist of Class 2, 3, 4, 5, and 6 soil under the Canada Land Inventory (CLI) classification system. Topsoil stripping and stockpiling would be done with the approval of the County of Lacombe and the district agriculturist.

NOVA/Shell stated that the integration of the proposed plant with a developed site would require minimal dedication of additional land to industrial use. It stated that utility access, road and rail access, and pipeline systems would all require additional land if the plant were located on a greenfield[4] site.

Views of the Interveners

AIA stated that, as far as practical, prime agricultural land should not be used for irreversible land-use purposes which would remove it from the production of food and fibre. AIA presented estimates showing that only 13 per cent of Canada's land area is capable of agricultural production, and, of that, only 4 per cent is suited to the growing of cereal and oil seed crops. It stated that 72 per cent of the proposed NOVA/Shell site is on CLI Class 1 to 3 land, and that very little construction would actually be taking place on lower-quality land. AIA also expressed concern over the proposed construction of 24 km of rail trackage on the site, mainly located on CLI class 2 soil, and suggested that NOVA/Shell should consider on-site storage facilities for a portion of the polyethylene which would be produced. AIA stated that, while Alberta's economy is very dependent on both the oil and gas industry and on agriculture, each must be located to supplement the other when only a third of the province is suited to cereal crop production.

F.E.M. Farms stated that poorer quality land should be utilized for industrial development, notwithstanding the possible extra costs of locating industrial plants on poor-quality soil. The extra costs associated with locating industrial plants on poorer soil would, according to F.E.M. Farms, be one-time costs as compared to non-terminating extra costs per unit of future food production on poorer soil. F.E.M. Farms stated that some 135 thousand acres of land falling into CLI

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[4] A greenfield site is a term used to denote a site not already used for industrial purposes, and which is separated from other industrial developments. The latter may by their existence provide ready access to established transportation networks, utilities, or other amenities which would be required for a greenfield site.

Classes 1 to 4 have been taken out of agricultural production for industrial plants in Alberta, mostly along the Highway 2 corridor which has some of the province's best land. This did not include good land that has been used for housing and infrastructure. F.E.M. Farms stated that within a 50-mile radius of Red Deer, an area of poorer agricultural land would lend itself to industrial development, and that the small towns which would be affected by the development would be "added to". F.E.M. Farms stated that the application should be denied because of the proposed plant's siting.

J. W. Hainsworth stated his opposition to further expansion of industry into an agricultural zone in the Joffre area. Mr. Hainsworth pointed out that there was very little opposition to the proposed site when it was approved in 1975 for the AGEC ethylene plant and allowable expansion, because it was believed that poorer quality land was to be used for the plant and not as buffer zone. Mr. Hainsworth stated that he did not think the Council of the County of Lacombe, of which he was a member in 1975, really understood the details of the original rezoning application, and that if it had, the land-use trade offs involved would have been looked at much more closely.

The Commission stated its position as neither favouring nor opposing the application. The Commission stated that its objective was to obtain balanced growth within the region of the 41 member municipalities which it encompasses, and that growth statistics for the last decade indicate that objective is not being met. The Commission stated that more than 70 per cent of the growth has been in the City of Red Deer or surrounding urban communities and that such growth is not supportive of a balance of opportunities in the region for jobs and services, nor is it within the best interests of preserving good arable soils. The Commission stated that it generally welcomed petrochemical activity in the region, provided that it is relatively clean, meets all provincial environmental requirements, and does not impose undue social pressures on area residents or undue service and support pressures on the municipalities which would be affected.

PAL stated that industrial siting must not be allowed on good agricultural land when alternative sites exist on poorer land, and that the Commission should be consulted as a first step in future industrial sitings in the region. PAL stated that in order to minimize the load on local residents respecting interventions at Board and local government hearings, a procedure should be set up whereby the Board could recommend to local government on land-use concerns. PAL recommended that the Board weigh the application of NOVA/Shell on its own merits rather than tying it to considerations on AGEC. The buffer zone that was indicated to local residents in respect to the AGEC plant site should not, according to PAL, be used by industry.

The Stettler and District Economic Development Board did not appear at the hearing, but indicated in its written submission that the poorer agricultural lands in east-central Alberta, with below-average rainfall, do not receive the same consideration when petrochemical sites are being chosen as do the prime farm lands close to the Calgary-Edmonton corridor.

Views of the Board

Respecting the impact on current and future land use in an area of a proposed industrial project, the Board believes that the suitability of each proposed location must be judged on its own merits. The Board notes that the proposed plant addition would adjoin the existing ethylene plant complex and agrees with the applicant that the total land requirements for the proposed plant and related facilities can be minimized through expansion at the existing plant site.

On the matter of land-use zoning the Board supports the position of AIA, F.E.M. Farms, J. W. Hainsworth, the Commission, PAL and others, that soils having good agricultural capacity generally should not be allocated for industrial and related urban development. Notwithstanding this view, the Board believes, on balance, that the amount of good quality agricultural land affected by the proposed plant is modest in relation to the public benefit that would be obtained, and therefore considers the location selected to be acceptable. In arriving at this conclusion, the Board has had regard for the amount of land which would be required if the proposed plant were located on a greenfield site, including that for utilities and infrastructure, most of which now exist at the AGEC site. At the same time, the Board believes there is a limit as to how much expansion should be permitted at any particular site. It notes that the applicant stated that there would be no further expansion at the proposed site beyond the possible future doubling of polyethylene plant capacity.

The Board notes the undertaking that topsoil stripping and stockpiling would be done with the prior approval of the County of Lacombe and the district agriculturist. The Board expects that this would lead to the identification, with the assistance of the Soils Branch of the Alberta Department of Agriculture, of areas amenable to top soil upgrading.

The Board has no comment on the matter of PAL's statement that a procedure should be set up whereby the Board could recommend to local government on land-use concerns. The Board notes that jurisdiction in land-use zoning rests primarily with local government authorities.

8 ECONOMIC IMPACT

Views of the Applicant

The applicant estimated capital costs to be $159 million in constant, 1980 dollars[5]. Of this, approximately $107 million would represent the value of Alberta resources used during project construction.

NOVA/Shell stated that between 85 and 95 per cent of the total operating costs would be expenditures within Alberta, and these would amount to about $241 million (1980 dollars) over the life of the project. The project's net cash flow, $580 million based on a 20 per cent rate of return, was also defined as an impact. Provincial and municipal taxes were estimated at $99 million and $24 million, respectively. An income/expenditure multiplier of 2.0 was applied to all project expenditures except taxes. Thus, the direct and indirect impacts were calculated to be about $1979 million (1980 dollars).

Construction of the proposed project was estimated to require two years, commencing in the third-quarter of 1982. Peak manpower requirements of up to 394 people would be during the second- and third-quarters of 1983, while the rest of the construction period would require between 200 and 270 people.

Operation of the plant would require a staff of 150 people, including operations, sales, technical service, and research personnel. The applicant attributed an employment multiplier of 3.5 to the project and, on that basis, predicted that ultimate manpower requirements in the Province would increase by 525.

Views of the Interveners

AEC/Esso contended that the applicant's estimate of economic impact was overstated due to the inclusion of all of the proposed project's net income in economic impact on Alberta. It suggested that if only 13 per cent of net income was considered, in keeping with the level of Alberta ownership, then Alberta economic impact would be about $1080 million (1980 dollars) as compared to the applicant's estimate of $1979 million.

Views of the Board

The Board accepts the applicant's estimate of capital costs as stated, noting that about $107 million (1980 dollars) would represent the Alberta component.

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[5] The adjustment from "current dollars" to "constant, 1980 dollars" attempts to account for the effects of inflation during the period under consideration. This adjustment does not affect the relative values of goods and services, but merely expresses relative values in terms of "non-inflated" dollars.

In its evaluation of the income/expenditure impacts of the proposed project, the Board made several adjustments to the applicant's estimates. Firstly, consistent with previous Board practice, fuel costs were deleted from operating expenses. The value of this deduction was based on the applicant's gas price forecast.

Secondly, although the applicant evaluated the potential income/expenditure multiplier effects exclusive of government revenues, the Board considers it reasonable to include them.

Finally, the Board included 13 per cent of the project's estimated net cash flow as an impact, reflecting the degree of Alberta participation in the project. This was contrary to the applicant's evidence, which included 100 per cent of the net cash flow as an Alberta impact.

The Board's findings are presented in two categories

1 those expenditures which are resource using, assuming that those resources are paid for at no more nor less than their market value, and

2 those incomes/expenditures (non-resource) which could be considered as net benefits to Alberta in the sense that they are in excess of the value of resources used.

The first category includes capital and operating expenses in Alberta. The second category includes Alberta's share of net cash flow, and provincial and municipal taxes. In counting provincial and municipal taxes as net benefits, it is assumed that no extra public expenditures would be required on behalf of the proposed project. To the extent that this is not true, the benefits would be overstated.

ECONOMIC IMPACT IN ALBERTA
(millions of 1980 dollars)

Resource Using Costs		
Capital Expenditures		107
Operating Expenditures		220
	Subtotal	327
Net Benefits (Non-Resource)		
Shareholders' Income		75
Provincial Income Tax		99
Municipal Tax		21
	Subtotal	195
TOTAL		522

The Board believes that income/expenditure multiplier effects are likely to result from developments such as the proposed project and notes that research is currently underway which will help to assess these spin-off effects more accurately. For the time being, however, the Board accepts 2.0 as being of reasonable magnitude for an income/expenditure multiplier. Thus, the Board estimates that the proposed project could have a potential direct and indirect impact of about $1050 million (1980 dollars) over its 20-year life.

In addition, there would likely be some spin-off effects on employment as a result of the proposed project. In its assessment of the potential magnitude of induced employment, the Board considered firstly that any sustained employment requires some level of recurring annual expenditures to be made in the province. In other words, an incremental and recurring annual expenditure can provide the financial where-withall for an incremental and long-term employment opportunity. It seems reasonable to assume that operating expenditures as stated in the above table, and a project's annual contribution to provincial and local taxes would generally form the basis for additional long-term direct and induced employment impacts in Alberta. The NOVA/Shell project would generate incremental expenditures of about $18 million (1980 dollars) per year. If an income/expenditure multiplier of 2.0 is applied, the total annual expenditures would be some $36 million (1980 dollars). This then would be viewed as the source of funds which would generate increased employment. The difficulty at this point is to determine a functional relationship between incremental expenditures and incremental employment.

The Board recognizes that there is more to generating employment than merely covering the salary of an additional employee. Employees require capital and other materials with which to work, all of which involve annual costs. For example, the capital and operating costs, excluding feedstock costs, for the proposed plant are about $500 000 per employee per year. If it is assumed that average annual capital and operating costs in Alberta would be $100 000 per employed person on the basis of a review of several corporate and government publications, the proposed project's expenditures and taxes could support some 360 workers. As 150 of these would be employees of the project, the induced employment impact would be about 210 jobs rather than 375 as suggested by the applicant. Since Alberta does not have a large pool of unemployed labour, the above sort of analysis is more important for anticipating manpower requirements and population shifts, than it is for assessing the employment "benefits" of an industrial development.

9 DECISION

Having regard for its findings and responsibilities under the Act, the Board is prepared, with the approval of the Lieutenant Governor in Council, to grant the applied for industrial development permit to the joint venture company of NOVA, AN ALBERTA CORPORATION and Shell Canada Limited. The Board believes that a permit term of 20 years, requested by NOVA/Shell, is appropriate. The permit would be in the form shown in Appendix B, and subject to all of the terms and conditions contained therein and to any terms and conditions imposed by the Lieutenant Governor in Council.

ISSUED at Calgary, Alberta on the 17th day of July, 1981.

GJ DeSorcy

G. J. DeSorcy, P. Eng.
Vice Chairman

N. Strom, P. Eng.
Board Member

H.J. Webber

H. J. Webber, P. Eng.
Acting Board Member

A. O. Olson
Acting Board Member

APPENDIX A

TABLE OF HEARING PARTICIPANTS

Principals and Representatives (Abbreviations used in Report)	Witnesses
NOVA, AN ALBERTA CORPORATION and Shell Canada Limited (NOVA/Shell) F. R. Foran E. M. Bredin, Q.C.	Dr. J. E. Feick, P.Eng. Dr. R. W. Betty, P.Eng. L. F. Bolger, P.Eng. G.L.W. Clark, P.Eng. C. W. Coote, P.Eng. Dr. W. A. Langford Western Research and Development staff E. Berlie, P.Eng. T. Reuvers W. Stephenson, P.Eng. D. Boyd, P.Eng.
Preserve Agricultural Land (PAL) F. E. Mueller G. Friesen	F. E. Mueller G. Friesen
Alberta Institute of Agrologists Red Deer Branch (AIA) G. Winia, P.Ag. G. McNaughton	G. Winia, P.Ag.
F.E.M. Farms F. E. Mueller	F. E. Mueller
J. W. Hainsworth	J. W. Hainsworth
Federation of Alberta Naturalists Land Use Committee D. Broadbent	
Red Deer Regional Planning Commission (Commission) L. C. Currie, MCIP	W.G.A. Shaw, MCIP L. C. Currie, MCIP
Dow Chemical of Canada Limited (DOW) B. Wilson	
Union Carbide Canada Limited (Union Carbide) D. G. Loader	

TABLE OF HEARING PARTICIPANTS (Cont'd)

Principals and Representatives (Abbreviations used in Report)	Witnesses
Alberta Energy Company Ltd. and Du Pont Canada Inc. (AEC/Du Pont) D. G. Hart	
Alberta Energy Company Ltd. and Esso Chemical Canada (AEC/Esso) D. G. Hart	
Alberta Environment staff K. Smith S. Lupul, P.Eng.	
Energy Resources Conservation Board staff M. J. Bruni P. Raina K. Johnston M. E. Mumby	

The Stettler and District Economic Development Board filed a submission but did not appear at the hearing.

APPENDIX B FORM OF PERMIT

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit to NOVA, AN ALBERTA CORPORATION and Shell Canada Limited authorizing the use within Alberta of ethylene and gas produced in Alberta in the production of polyethylene

INDUSTRIAL DEVELOPMENT PERMIT NO. N/S 81-2

WHEREAS NOVA, AN ALBERTA CORPORATION and Shell Canada Limited have applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42 of The Oil and Gas Conservation Act, authorizing the use of ethylene and gas produced in Alberta for the production of polyethylene in Alberta; and

WHEREAS the Board is of the opinion that the granting of this industrial development permit for the use of ethylene as raw material and gas as fuel in the production of polyethylene is in the public interest, having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council, by Order in Council, numbered O.C. and dated has authorized the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to NOVA, AN ALBERTA CORPORATION and Shell Canada Limited (hereinafter called "the Permittees") authorizing the use of ethylene as raw material and gas as fuel in the production of polyethylene, subject to the regulations and orders made pursuant to the said Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use by the Permittees of ethylene as raw material and gas as fuel in the production of approximately 310 000 tonnes of polyethylene per year as described in the application from the Permittees to the Board dated November 14, 1980.

2. The ethylene as raw material and gas as fuel authorized by clause 1 is for use in a polyethylene plant which shall be located in Sections 29, 31 and 32, all in Township 38, Range 25, West of the 4th Meridian.

3. Subject to the conformity by the Permittees with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on December, 31, 2004.

4. The quantity of energy resources that may be used in the facilities referred to herein in the production of polyethylene shall not exceed 300 000 tonnes of ethylene per calendar year as raw material nor 10 000 000 cubic metres of gas per calendar year as fuel.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37 400 000 joules per cubic metre.

6. All ethylene and gas used in producing polyethylene pursuant to this permit shall be measured by or on behalf of the Permittees in a manner satisfactory to the Board, and the volumes of ethylene used as raw material, gas used as fuel and polyethylene produced shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittees shall obtain the approval of the Board of any major changes in design of the plant facilities.

8. (1) The Permittees shall satisfy the Board prior to January 1, 1984, as to the arrangements that have been made for the supply of energy resources for the operation of their

polyethylene plant, unless upon application by the Permittees a later date is stipulated by the Board.

(2) The Permittees shall satisfy the Board prior to July 1, 1982, that construction of their proposed plant has commenced or will commence on or before January 1, 1983, and that construction of the proposed facilities will continue in accordance with a schedule approved by the Board, unless upon application by the Permittees, later dates are stipulated by the Board.

(3) During the construction of the proposed project, the Permittees shall inform the Board, on a semi-annual basis, of the progress of construction.

9. The Permittees shall operate the facilities in a manner that results in

(a) the maximum practicably obtainable efficiency in the use of ethylene and gas for the manufacture of polyethylene, and

(b) the maximum practical conservation of ethylene and gas.

10. The Permittees shall not

(a) assign this permit, or

(b) release from their control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

11. (1) Attached hereto as Appendix A and made part of this permit is the order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the order of the Lieutenant Governor in Council set out in Appendix A.

12. Where it appears to the Board or the Lieutenant Governor in Council that the Permittees have contravened or failed to comply with any terms or conditions contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and with the approval of the Lieutenant Governor in Council may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

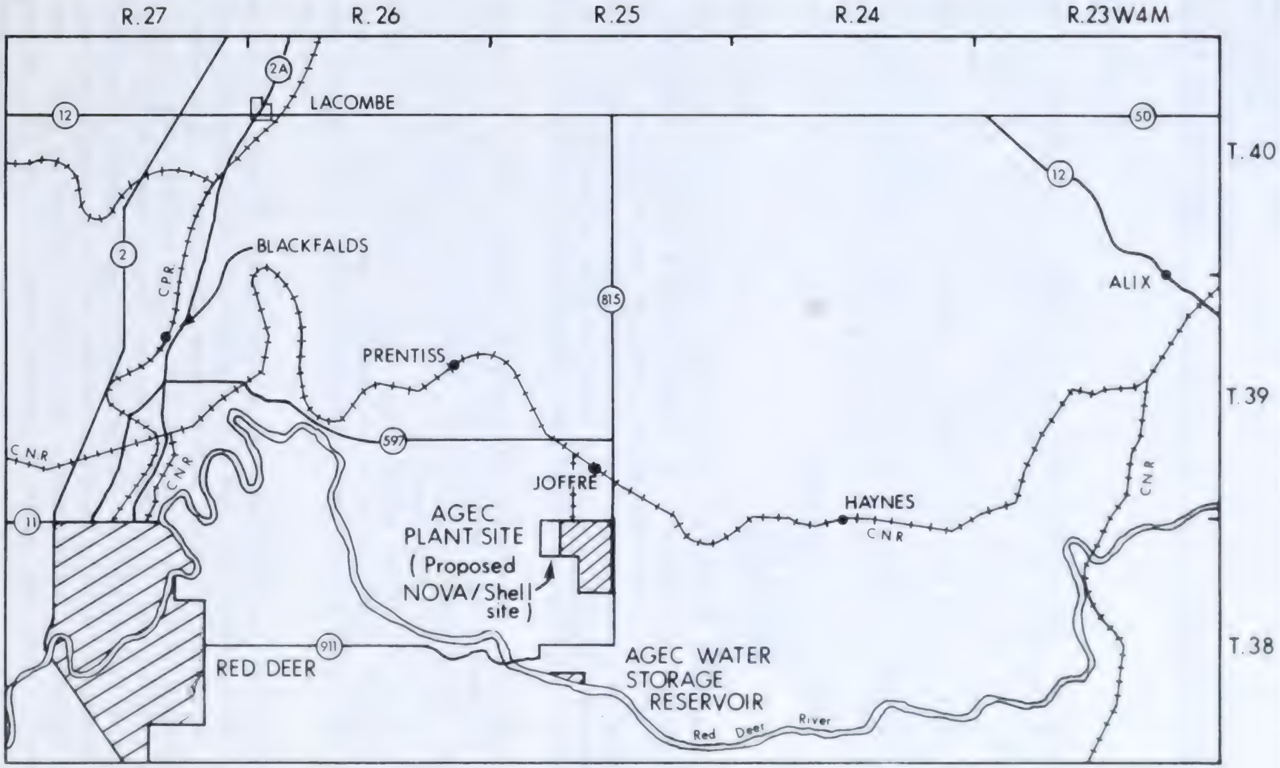
(b) the Lieutenant Governor in Council may amend, vary, add to or replace any terms or conditions contained in this permit.

13. Notwithstanding the provisions hereof, the Permittees shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of energy resources within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

Vernon Millard
Chairman



Adapted from the NOVA/Shell application No. 800853

APPENDIX C LOCATION OF THE JOFFRE PLANT SITE.

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

ALBERTA ENERGY COMPANY LTD.
AND DU PONT CANADA INC.
INDUSTRIAL DEVELOPMENT PERMIT
TO MANUFACTURE POLYETHYLENE

Decision 81-17
Application 801017

1 INTRODUCTION

Alberta Energy Company Ltd. (AEC) and Du Pont Canada Inc. (Du Pont) (as a joint-venture company hereinafter referred to as AEC/Du Pont) applied, pursuant to section 42, subsection (2) of The Oil and Gas Conservation Act (the Act), for an industrial development permit which would authorize the use of ethylene as feedstock and gas as fuel in the manufacture of polyethylene at a new plant to be constructed near Redwater, Alberta (see map, Appendix C). The applicant requested a permit term of 20 years commencing with plant start-up, projected for mid-1984.

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2 APPLICATION

The industrial development permit applied for by AEC/Du Pont would authorize the annual use of 238 000 tonnes of ethylene as feedstock and 33 500 000 cubic metres of gas as fuel, to manufacture 240 700 tonnes of polyethylene. The AEC/Du Pont joint-venture company would be headquartered in Alberta and would market polyethylene in Canada, the United States, Western Europe, Central/South America, and other Pacific Rim countries.

The proposed plant would operate at moderate pressures. Ethylene feedstock would be dissolved in a solvent/comonomer solution and pumped to a reactor, into which catalyst would be injected. The solvent, unreacted comonomer, and ethylene would be separated from the polymer and recycled to the process via a purification train. Impurities would be purged to the flare or burned as auxiliary fuel. The polymer would be extruded, solidified, cut into pellets, stripped of residual solvent, and loaded into rail hopper cars for shipment.

AEC/Du Pont stated that it would expect to obtain all of its ethylene feedstock requirements from The Alberta Gas Ethylene Company Ltd., on a cost of service basis. Fuel gas requirements would be purchased in Alberta at prevailing market prices and an annual electric energy requirement of 87 000 000 kilowatt hours would be obtained from Calgary Power Ltd. Hydrocarbon comonomer and solvent would be obtained from Du Pont Canada's plant at Sarnia, or from other chemical plants in Canada or the United States. The applicant stated that under normal operating conditions it would remove 2.73 to 4.55 cubic metres of water per minute from the North Saskatchewan River.

Alberta Energy Company Ltd. stated that it is a wholly-owned Canadian company and that 76 per cent of its common shares are held by Albertans; Du Pont Canada Inc. stated that 23.7 per cent of its shares are held by Canadians, and that less than 1 per cent are held by Albertans.

3 HEARING

A public hearing of the application was held in Edmonton, Alberta, on 7 and 8 July 1981, with V. Millard, C. J. Goodman, P.Eng., and H. J. Webber, P.Eng., sitting. Participants at the hearing and the abbreviations used in this report are listed in Appendix A.

4 ISSUES

Having regard for its responsibilities under section 42 of the Act, the Board considers the primary issues of the application to be:

a the availability of feedstock and fuel for the proposed plant, and the efficient use of energy resources in the project,

b markets for the polyethylene to be produced,

c the impact of the proposed project on the Alberta economy, and

d location of the proposed plant with respect to land use.

Additional matters raised at the hearing and meriting consideration are, the applied for permit term, and the conduct of E. I. Du Pont Nemours in respect to the marketing of Canadian methanol in the United States.

5 GENERAL POSITION OF INTERVENERS

The Town of Gibbons, the Town of Redwater, and the Municipal District of Sturgeon intervened in support of the application. The towns of Gibbons and Redwater both stated that they would be able to provide services to meet the needs of employees and secondary industries which would locate in their areas as a result of the project.

Alberta Gas Chemicals Limited (AGCL) requested that the application be denied because of actions taken by Du Pont Canada's parent company, E. I. Du Pont Nemours, against AGCL in the United States. In closing argument, AGCL requested that, if the application is considered to be of equal merit to similar recent applications submitted to the Board for consideration, the Board examine the conduct of E. I. Du Pont Nemours with respect to Canadian companies attempting to market petrochemicals in the United States.

Mr. C. Minchau expressed concern respecting the industrial use of land which he believed is of greater agricultural value than indicated by the applicant. Mr. Minchau suggested an alternative location near the proposed site.

CIL/Trimac neither opposed nor supported the proposed project, but stated that the pricing and cost assumptions underlying the economic impact assessment were vague and over-simplistic.

NOVA/Shell stated that it had an application before the Board to construct a polyethylene plant near Joffre[1], and asked the Board to consider the "character and composition" of each applicant requesting the use of ethylene in judging the relative merits of applications involving the use of ethylene.

Union Carbide stated that it was ready to proceed with an ethylene glycol plant in Alberta[2], and asked the Board to consider the importance to the Alberta public interest of the diversification of ethylene use for derivative manufacturing. (The Board's decision on Union Carbide's application is pending.)

6 AVAILABILITY AND EFFICIENT USE OF ENERGY RESOURCES

6.1 Availability of Fuel

AEC/Du Pont submitted a letter from Northwestern Utilities Limited (NUL), in which NUL indicated that its existing pipeline facilities could be improved and extended to deliver AEC/Du Pont's required gas supplies.

The Board is confident that sufficient supplies of gas will be available in Alberta for the proposed use over the requested term of permit. It would, however, condition any permit issued that AEC/Du Pont satisfy the Board prior to plant start-up as to the arrangements made for the required gas volumes.

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[1] NOVA, AN ALBERTA CORPORATION and Shell Canada Limited, Application 800910, November 1980. Industrial Development Permit to Manufacture Polyethylene.

[2] Union Carbide, Application 800889, October 1980. Industrial Development Permit to Manufacture Ethylene Glycol.

6.2 Availability of Feedstock

Views of the Applicant

The applicant expected that the proposed plant would be capable of producing the name-plate capacity of 225 000 tonnes during its third full year of operation, and that production could eventually be increased to some 107 per cent of name-plate capacity. The applied-for quantity of ethylene is based on this higher production rate.

At the time of the hearing, the applicant did not have a contracted supply of ethylene for its project. The only available ethylene which AEC/Du Pont believed could meet its requirements would be that from AGEC's second ethylene unit (AGE II). AEC/Du Pont stated that it has been consistently refused an opportunity by AGEC to enter into negotiations for an ethylene supply from this source. The applicant further stated that, while it is actively seeking alternative sources of ethylene, a critical dimension of any alternative arrangement would be its timing. AEC/Du Pont expected to be ready with its proposed facility by mid-1984, and the only ethylene supply that would be available at that time would be from AGE II. Feedstock delays would directly and seriously affect the applicant's marketing and business plans.

The applicant presented its assessment of the Alberta ethylene supply-demand situation during the 1984-87 period. This projection, which was based on the name-plate capacities of ethylene producing and consuming facilities, showed ethylene supply deficits in 1984 and 1985, with supplies approaching demand in 1986. A projection of ethylene demand during 1990 was also presented to reflect the impact of ethylene use above name-plate requirements, as has been requested by most applicants for industrial development permits. This analysis showed ethylene supply falling short of total demand.

The applicant noted that one of the conditions attached to Order in Council 213/81, which approved AGE II, requires that the ethylene produced at AGE II be upgraded within Alberta to the maximum extent possible. In this regard, all ethylene supply contracts from AGE II must receive the approval of the Minister of Economic Development. AEC/Du Pont believed that its project would have a considerably greater economic impact on Alberta than many other projects before the Board, and that it would be of substantial benefit to the development of secondary manufacturing in the province. On this basis, and in conjunction with the undertakings of Order in Council 213/81, the applicant believed it should be granted an ethylene supply from AGE II.

AEC/Du Pont noted that the construction phase of its project could proceed as soon as permits were received and an ethylene feedstock secured. The applicant would not proceed with construction before it had secured its required ethylene supply.

Views of the Interveners

In closing argument, Union Carbide submitted that the diversification of ethylene use for derivative manufacture, in the context of a balanced slate of both producers and marketers, would minimize risks to the Alberta petrochemical industry as a whole and further the Alberta public interest.

NOVA/Shell argued that, should the Board take the approach that if ethylene supplies fall short of total demand, some projects should be denied permits, and the Board must look carefully at the character and composition of each applicant before it. NOVA/Shell submitted that the AEC/Du Pont project was dominated by Du Pont Canada Inc.

Views of the Board

The Board has reviewed future ethylene supply and demand in Alberta. In its evaluation, the Board included ethylene supplies which would be available from AGEC's third ethylene unit and made no allowances for ethylene volumes leaving the province. The Board recently indicated in Decision 81-10[3], that it is prepared to approve the third ethylene unit. However, the authorization of the Lieutenant Governor has not yet been received. On the basis of its own review, the Board is satisfied that sufficient supplies of ethylene will be available in Alberta to provide feedstock to all existing and approved ethylene upgrading facilities, as well as AEC/Du Pont's proposed plant. The Board does note, however, that during the 1984-85 period, ethylene requirements in Alberta will likely approach the volume of projected supplies. Therefore, any delay in the start-up schedule of the planned ethylene-producing facilities could affect the commissioning date for plants which would depend on them for ethylene feedstock. Also, the Board recognizes that there may be additional plans for the upgrading of ethylene within Alberta for which applications have not yet been filed. Such projects, if they were to come forward and receive approval, would tighten the ethylene supply/demand balance.

As the Board believes that sufficient volumes of ethylene will be available in Alberta to satisfy demand, including AEC/Du Pont's projected needs over the requested term of permit, it would be prepared, all other public interest matters being acceptable, to authorize the use of the applied-for ethylene volumes. However, from the evidence submitted, the Board believes that in order for AEC/Du Pont to obtain its ethylene feedstock from its intended sources of supply, AGE II, the intervention of the Minister of Economic Development would be required. One of the conditions attached to Order in Council 213/81, which approved AGE II, requires that the Minister approve all ethylene sales contracts from that plant. As AEC/Du Pont has not yet contracted for its ethylene feedstock, the Board would condition any permit issued such that AEC/Du Pont must satisfy the Board prior to plant start-up as to the firm commitments made for its required ethylene supply. Further, as the granting of an industrial development permit does not constitute an automatic allocation of resources, the Board takes the position that any risks associated with obtaining the required energy resources are properly those of the permittee. The Board notes, in this connection, that the applicant stated that it would not begin construction of the proposed plant before an ethylene supply had been secured.

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[3] The Alberta Gas Ethylene Company Ltd., Industrial Development Permit to Manufacture Ethylene. ERCB Decision Report 81-10, June 1981.

6.3 Efficient Use of Resources

Views of the Applicant

The applicant stated that it had reviewed the Du Pont polyethylene technology and compared it with the technology of its competitors. On the basis of its review, the applicant was convinced that the manufacturing efficiency of the Du Pont process compared favourably with other processes for the production of comparable products.

The applicant submitted energy and material balances based on its current design flow sheets, which reflected improvements in Du Pont's existing operation and engineering improvements that would be included in the proposed facility. AEC/Du Pont estimated the overall conversion rate of ethylene and comonomer to polyethylene to be some 98 per cent and estimated the plant energy efficiency, on an inside battery limits[4] basis, to be some 86 per cent.

Respecting natural gas consumption, the applicant stated that a considerable portion of its applied-for gas volumes would be used to meet the requirements of service and office facilities on the proposed site. The applicant submitted that if the plant were to be constructed on an existing petrochemical site, it would not have to provide many of these auxiliary facilities and, consequently, its fuel gas requirements would be reduced.

Views of the Board

The Board notes that the overall conversion rate of ethylene and comonomer would be some 98 per cent and it is satisfied that this represents up-to-date technology.

Respecting gas consumption, the Board accepts AEC/Du Pont's view that a plant located on a "greenfield" site would have a larger fuel gas requirement than one located on an established site. The Board would therefore expect, if this project were approved, that any subsequent applications for expansion at this location would reflect such economies in energy consumption.

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[4] Includes those facilities associated directly with the manufacture, finishing, and shipping of polyethylene.

7 MARKETING

Views of the Applicant

The applicant indicated that polyethylene from the proposed plant would be marketed by Du Pont in conjunction with the polyethylene product from its Sarnia operation. Export markets would initially absorb over 50 per cent of the plant output, and fall to approximately one-third as Canadian demand for polyethylene grew. The applicant expected that the portion of plant output which would be upgraded in Alberta would be approximately 10 per cent by the mid-1980s, increasing modestly thereafter. The applicant forecast a growth in free world demand for linear low density polyethylene (LLDPE) of 12 per cent per annum from 1985-1990 and 4 per cent per annum for all grades of polyethylene over the same period. Domestic polyethylene demand was forecast to grow at an average annual rate of 9.4 per cent from 1980-1985 and 7.4 per cent from 1986-1990.

The applicant said it believed that a significant structural change in polyethylene markets will occur over the next decade, with low density polyethylenes making up a larger share of total polyethylene demand. The applicant forecast that a ten-fold increase in LLDPE manufacturing capacity would be developed to meet this demand, resulting in excess supply in world markets through 1990.

Views of the Board

The Board accepts the applicant's evaluation of polyethylene market supply and demand and recognizes Du Pont's experience in marketing this product in domestic and export markets. The Board notes, however, that the applicant's evidence indicates an excess supply of polyethylene will exist in Canada through 1990, requiring significant sales to export markets. In light of the forecast excess supply of LLDPE in world markets through 1990, such a situation could result in a reduction in capacity utilization and a consequent reduction in net income. Any such adverse market conditions would likely be short-term in nature.

8 ECONOMIC IMPACT

Views of the Applicant

AEC/Du Pont estimated that peak manpower requirements during the construction phase of the proposed project would be 640 workers in the third-quarter of 1983. A total of 180 operating and maintenance personnel would be employed during the operating phase. The applicant stated that it did not foresee a manpower shortage during the construction phase of the proposed project.

AEC/Du Pont estimated the total capital cost of the project to be $200 million (1980 dollars). The Alberta component of total capital expenditures including pre start-up expenses was estimated to be $138 million. Operating costs over the project life, excluding ethylene, natural gas, interest, depreciation, and freight costs, were estimated to total $700 million over the 20-year project life. The Alberta content of operating costs was forecast to be $595 million.

The direct economic impact on Alberta from reinvestment of net income was assumed to correspond to the Alberta ownership percentage of the proposed project. Net income, after deduction of federal and provincial taxes, was calculated to be $487 million, of which $190 million would have a direct impact on Alberta. The cumulative provincial and municipal taxes were estimated at $92 million and $25 million, respectively. An estimate of the impact of federal tax payments on Alberta was not made. The applicant estimated a total direct impact on Alberta of $1040 million. An income multiplier of 2.0 was applied to the direct impact, resulting in a total economic impact of $2080 million.

Views of the Board

The Board accepts the manpower requirements as provided and concurs with the applicant that competing demands for labour should not delay project completion.

The Board accepts the applicant's capital and operating cost estimates and the Alberta content forecasts as presented. After-tax net income accruing to Alberta, was calculated in a manner consistent with Board evaluations of similar applications. While the applicant assumed that a portion of net income would be reinvested and therefore would be a direct benefit to the province, the Board believes that net income accruing to Albertans does not have to be reinvested to provide a direct impact to the province. The applicant's estimate of municipal taxes is reasonable. The Board estimates provincial tax payments over the project life to be $101 million (1980 dollars). The Board's evaluation of the impact of the AEC/Du Pont project on Alberta is provided in the table below.

Component	Economic Impact During Project Operation Millions of 1980 Dollars
Capital Expenditures	138
Operating Costs	595
Provincial Taxes	101
Municipal Taxes	25
Net Income	190
Total Direct Impact	1 049
Indirect Impact	1 049
Total Impact	2 098

9 LOCATION WITH RESPECT TO LAND USE

Views of the Applicant

The proposed development would occupy some 600 hectares (1500 acres) of land and would be located in section 13, township 56, range 22, in section 18, township 56, range 21, and in the northeast quarter of section 7, township 56, range 21, all west of the 4th meridian in the Municipal District of Sturgeon.

AEC/Du Pont stated that the plant would be constructed on 80 hectares (200 acres) of land classified No. 4 for agricultural purposes under the Canada Land Inventory (CLI) system, and that this was the poorest land on the 600-hectare (1500-acre) site proposed for the project. The applicant stated that it is satisfied the proposed site meets its objectives after consideration of such factors as the cost of plant construction and operation, ethylene availability, transportation facilities, availability of electrical and gas services, proximity to dependable water supplies, and environmental considerations.

Views of the Interveners

The proposed site was supported by the towns of Gibbons and Redwater and the Council of the M.D. of Sturgeon. The towns of Gibbons and Redwater stated that they were in a position to provide services to the employees and to related secondary industries which would likely require them as a result of the project.

Mr. C. Minchau expressed concern regarding the location of the plant, stating that an alternative site approximately three miles to the northwest would not take up prime agricultural land. Mr. Minchau stated that to his knowledge, as an owner of land adjacent to the proposed site, the land was made up of soils classified as either No. 1 or 2, with the exception of approximately 10 per cent below Class 2. Also, stating barley yields in excess of 85 bushels per acre having recently been produced on his own land, Mr. Minchau stated that there would not be much difference between the soils making up the proposed AEC/Du Pont site and his own. Mr. Minchau stated further, that soils in the classifications which he believed make up the proposed site are among the highest taxed soils for agricultural purposes, and that the municipality rezoned the land for heavy industrial use strictly on the basis of a larger tax base rather than on the agricultural worth of the land.

Views of the Board

The Board recognizes the differing views of the applicant and Mr. Minchau respecting the soil quality of the proposed plant site. The applicant presented evidence supporting its contention that the lands in question are classified as No. 4 under the CLI system, and are the lowest quality land on the 1500-acre parcel. The Board also notes that the lands have been rezoned for heavy industrial use by the municipality. While appreciating Mr. Minchau's concerns, the Board believes that the proposed site is reasonable.

10 OTHER MATTERS

10.1 Permit Term

AEC/Du Pont requested that a permit for the use of energy resources in the production of polyethylene be issued for a term of 20 years commencing with plant start-up projected for 1984.

The Board believes that the permit term requested by AEC/Du Pont is appropriate.

10.2 The Conduct of E. I. Du Pont Nemours Respecting The Sale of Canadian Methanol in the United States

Views of the Interveners

AGCL requested that the application be denied, stating that it was really being made by Du Pont Canada's parent company, E. I. Du Pont Nemours, which recently brought dumping charges against methanol being marketed in the United States by AGCL. (Following appeal of the initial decision, the dumping duties which were imposed on Canadian methanol by the International Trade Commission were withdrawn.) AGCL stated in closing argument that this aspect of the conduct of E. I. Du Pont Nemours should be considered by the Board if it finds the present application to be equal to but not superior to other applications requiring Alberta resources.

Views of the Applicant

AEC/Du Pont stated in closing argument that it believed the intervention of AGCL to be irrelevant, since it alleged certain actions in a foreign country by a U.S. company which is not a participant in the subject AEC/Du Pont joint-venture application.

Views of the Board

The Board agrees with the applicant that matters raised in respect to the actions taken by E. I. Du Pont Nemours against Canadian methanol are irrelevant to its decision on this application.

11 DECISION

Having regard for its findings and responsibilities under the Act, the Board is prepared, with the approval of the Lieutenant Governor in Council, to grant the applied-for industrial development permit to Alberta Energy Company Ltd. and Du Pont Canada Inc. The permit would be in the form shown in Appendix B, and subject to all of the terms and conditions contained therein and to any terms and conditions imposed by the Lieutenant Governor in Council.

ISSUED at Calgary, Alberta, on 31 August 1981.

ENERGY RESOURCES CONSERVATION BOARD

V. Millard
Chairman

C. J. Goodman

C. J. Goodman, P.Eng.
Board Member

H J Webber

H. J. Webber, P.Eng.
Acting Board Member

APPENDIX A

TABLE OF HEARING PARTICIPANTS

Principals and Representatives (Abbreviations used in Report)	Witnesses
Alberta Energy Company Ltd. and Du Pont Canada Inc. (AEC/Du Pont) D. G. Hart	F. W. Proto Dr. J. M. Stewart J. C. Carson R.A.S. Noble H. J. McFadyen G. A. Cockfield T. J. Cavanagh W. S. Cotton, P.Eng. Dr. A. Lamb, P.Eng. T. A. MacDougall, P.Eng.
Alberta Gas Chemicals Ltd. (AGCL) J. C. Major, Q.C.	A. E. Egglestone, P.Eng.
C-I-L Inc. and Trimac Limited (CIL/Trimac) J. R. Smith, Q.C.	
Town of Gibbons R. E. Austin	R. E. Austin
Council of the Town of Redwater (Town of Redwater) J. Dennett	J. Dennett
Dow Chemical of Canada, Limited (Dow) A. H. Sears	
Clarence and Doreen Minchau C. Minchau	C. Minchau
Municipal District of Sturgeon No. 90 (M.D. of Sturgeon) K. Everitt, Reeve	K. Everitt
NOVA, AN ALBERTA CORPORATION and Shell Canada Limited (NOVA/Shell) F. R. Foran	
K. Smulski[5] K. Smulski	

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[5] Mr. K. Smulski did not submit an intervention but appeared for the purpose of cross-examination.

TABLE OF HEARING PARTICIPANTS cont'd

Principals and Representatives (Abbreviations used in Report)	Witnesses
The Alberta Gas Ethylene Company Ltd. (AGEC) F. R. Foran	
Union Carbide Canada Limited (Union Carbide) J. W. Beames, Q.C.	
Alberta Environment staff S. Lupul, P.Eng.	
Energy Resources Conservation Board staff (Board) D. A. Holgate P. Raina T. Walden D. Mulrain M. E. Mumby	

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit to Alberta Energy Company Ltd. and Du Pont Canada Inc. authorizing the use within Alberta of ethylene and gas produced in Alberta in the production of polyethylene

INDUSTRIAL DEVELOPMENT PERMIT NO. AEC/DP 81-1

WHEREAS Alberta Energy Company Ltd. and Du Pont Canada Inc. have applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42 of The Oil and Gas Conservation Act, authorizing the use of ethylene and gas produced in Alberta for the production of polyethylene in Alberta; and

WHEREAS the Board is of the opinion that the granting of this industrial development permit for the use of ethylene as raw material and gas as fuel in the production of polyethylene is in the public interest having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council, by Order in Council, numbered O.C. and dated has authorized the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to Alberta Energy Company Ltd. and Du Pont Canada Inc. (hereinafter called "the Permittees") authorizing the use of ethylene as raw material and gas as fuel in the production of polyethylene, subject to the regulations and orders made pursuant to the said Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use by the Permittees of ethylene as raw material and gas as fuel in the production of approximately 240 750 tonnes of polyethylene per year as described in the application from the Permittees to the Board dated 17 December 1980.

2. The ethylene as raw material and gas as fuel authorized by clause 1 is for use in a polyethylene plant to be located in Section 13, Township 56, Range 22, Section 18, Township 56, Range 21, and the North-east quarter of Section 7, Township 56, Range 21, all West of the 4th Meridian.

3. Subject to the conformity by the Permittees with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on 31 December 2004.

4. The quantity of energy resources that may be used in the facilities referred to herein in the production of

polyethylene shall not exceed 238 000 tonnes of ethylene per calendar year as raw material nor 33 500 000 cubic metres of gas per calendar year as fuel.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37 400 000 joules per cubic metre.

6. All ethylene and gas used in producing polyethylene pursuant to this permit shall be measured by or on behalf of the Permittees in a manner satisfactory to the Board, and the volumes of ethylene used as raw material, gas used as fuel and polyethylene produced shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittees shall obtain the approval of the Board of any major changes in design of the plant facilities.

8. (1) The Permittees shall satisfy the Board prior to , as to the arrangements that have been made for the supply of energy resources for the operation of their polyethylene plant, unless upon application by the Permittees a later date is stipulated by the Board.

(2) The Permittees shall satisfy the Board prior to that construction of their proposed project has commenced or will commence on or before , and that construction of the proposed facilities will continue in accordance with a schedule approved by the Board, unless upon application by the Permittees later dates are stipulated by the Board.

(3) During the construction of the proposed project the Permittees shall inform the Board, on a semi-annual basis, of the progress of construction.

9. The Permittees shall operate the facilities in a manner that results in

(a) the maximum practicably obtainable efficiency in the use of ethylene and gas for the manufacture of polyethylene, and

(b) the maximum practical conservation of ethylene and gas.

10. The Permittees shall not

(a) assign this permit, or

(b) release from their control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

11. (1) Attached hereto as Appendix A and made part of this permit is the order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the order of the Lieutenant Governor in Council set out in Appendix A.

12. Where it appears to the Board or the Lieutenant Governor in Council that the Permittees have contravened or failed to comply with any terms or conditions contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and with the approval of the Lieutenant Governor in Council may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

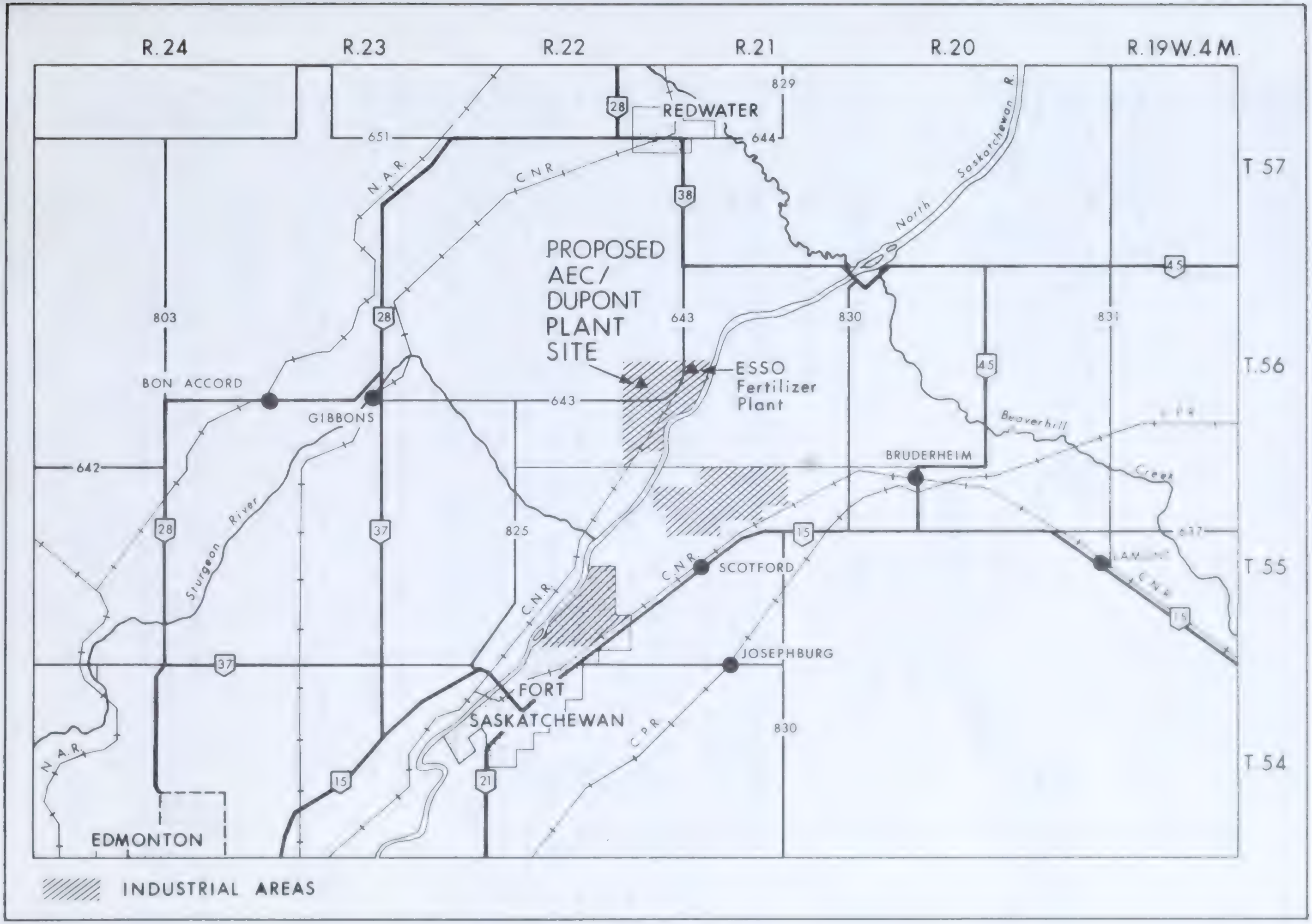
(b) the Lieutenant Governor in Council may amend, vary, add to or replace any terms or conditions contained in this permit.

13. Notwithstanding the provisions hereof, the Permittees shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of energy resources within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of .

ENERGY RESOURCES CONSERVATION BOARD

Vernon Millard
Chairman



APPENDIX C LOCATION OF THE PROPOSED AEC/DUPONT PLANT

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA CANADA

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

APPLICATIONS BY
DOME PETROLEUM LIMITED
TO REINSTATE WELL LICENCE NO. 88984
AND FOR A LICENCE TO DRILL A WELL,
DOME ET AL LINDBERGH 7A-7-56-6 W4M
LINDBERGH FIELD

Decision 81-18
Applications
810346 and 810347

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1 INTRODUCTION

1.1 The Applications

Dome Petroleum Limited (Dome) applied, pursuant to provisions of The Oil and Gas Conservation Act and the Regulations thereto, in Application 810346 to reinstate well Licence No. 88984 for the well, Dome et al Lindbergh 7A-10-56-6 W4M (7A-10 well), and in Application 810347 for a licence to drill a well in legal subdivision (lsd) 7, section 7, township 56, range 6, west of the 4th meridian (7A-7 well).

The licence for the well, Dome et al Lindbergh 7A-10-56-6 W4M, was issued on 13 February 1981 and was suspended 2 March 1981, when it became evident to the Energy Resources Conservation Board (Board) that the applicant had not reached an agreement with the surface owner with respect to the location of the well. On 24 March 1981, Dome applied to the Board to have the licence reinstated.

The primary purpose of the wells would be to obtain heavy oil production from the Cummings Sand of the Cretaceous Age.

The surface owner who is farming the lands in question, Mr. Gordon M. Miller (the intervener), filed objections to the applications.

1.2 The Hearing

A public hearing respecting the applications was held on 18 and 19 June 1981, at Lloydminster, Alberta before a Board panel comprised of G. J. DeSorcy, P.Eng., Chairman, C. J. Goodman, P.Eng., and N. Strom, P.Eng.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Dome Petroleum Limited (Dome) C. K. Yates	M. Fontana, P.Geol. T. McGlynn T. Reidy
Gordon M. Miller P. T. Johnston	G. M. Miller L. Miller M. Miller A. Bugeja
Energy Resources Conservation Board (Board staff) M. J. Bruni J. R. Nichol, P.Eng. M. Semchuck H.J.W. Piet, C.E.T.	

2 THE ISSUES

The Board considers the issues respecting the applications to be:

- the need for the proposed wells,
- suitability of the selected well sites and alternative locations for petroleum exploitation, and
- impact of the proposed well sites including access roads on farming operations and alternatives that might reasonably accommodate the intent of the applicant and the desires of the surface landowner.

3 NEED FOR THE PROPOSED WELLS

3.1 The Applicant's Views

The applicant advised that an agreement with Sulpetro Limited allowed it to earn the oil rights by drilling in section 10-56-6 W4M. Dome stated that geological and production information from wells located in lsd 7-11 and lsd 11-10 in 56-6 indicated that a geological trend may exist between the two wells and that the 7A-10 well would verify its existence. Although Dome acknowledged that the heavy oil-bearing Cretaceous sands are quite widespread in the area, it stressed that rapid changes in sand characteristics dictate discretion in well site selection.

Dome advised that by way of a farm-in agreement with PanCanadian

Petroleum Limited, it has the right to earn the petroleum and natural gas rights in section 7-56-6 W4M. Wellbore data surrounding section 7 indicated that the Cummings B sand thickens in the easterly part of the section. Dome stated that the 7A-7 well is required to prove this trend and verify productivity.

3.2 The Intervener's Views

The intervener, Mr. G. M. Miller, did not dispute that Dome is entitled to win the minerals on lands for which it holds or has an agreement to acquire the mineral rights. His opinion was that there may be viable alternative well sites from a geological standpoint that would reduce the degree of disruption to the present surface land use.

3.3 The Board's Views

The Board agrees that wells would have to be drilled somewhere on the lands in question to confirm and demonstrate the production capability of the heavy oil occurrences referred to by Dome.

4 SUITABILITY OF THE SELECTED WELL SITES AND ALTERNATIVE LOCATIONS FOR PETROLEUM EXPLOITATION

4.1 The Applicant's Views

Dome stated that the 7A-10 well site was selected having regard for both its potential to confirm pay thickness trends, and well target provisions for quarter section drilling spacing units (DSUs). The site would allow the well to be drilled on target for the present 160-acre (64-ha) DSU in addition to being on target for 40-acre (16-ha) spacing recently applied for by Dome.

Dome indicated the proposed 7A-7 location would allow the well to be drilled on target for the existing 160-acre DSU and, also, geological interpretations would be verified.

Dome agreed that current indications are that in both cases other well sites of equal geological merit could have been chosen. However, it had not considered applying for a special target designation as a means of resolving the disagreement with the landowner.

4.2 The Intervener's View

The intervener contended that a high degree of geological flexibility existed in sections 7 and 10 and that moving the proposed well sites into lsd 1, 8, or 7 in each section would provide Dome with an equal chance of drilling successful oil wells.

4.3 The Board's View

The Board notes the applicant's preference to drill 7A-10 at the site selected in order to conform to well target provisions for the current

160-acre (64-ha) DSU and the anticipated 40-acre (16-ha) DSU.

The Board agrees that, based on the accuracy of Dome's geological interpretation, the proposed wells could help confirm the subsurface trends for the Cummings heavy oil sands in each of the subject quarter sections. The Board notes that relocation to several other potential sites within the existing quarter section DSU target areas would be possible without increased geological risk.

5 IMPACT OF THE PROPOSED WELL SITES ON FARMING OPERATIONS AND ALTERNATIVE LOCATIONS

5.1 The Applicant's Views

According to Dome, the proposed 7A-10 well site and access road would take a total of 4.7 acres (1.9 ha) of land from agricultural production. Originally, it had surveyed the access road for the proposed well directly from the east boundary of lsd 8 in section 10. The access road was subsequently re-routed parallel to the north boundary of lsd 8 and then extended due south to the proposed 7A-10 site with the intent of minimizing the interference with agricultural operations (as shown in Figure 1).

A total of 3 acres (1.2 ha) of land would be taken out of agricultural production for the 7A-7 well and access road. Dome stated that the access road for 7A-7 was routed directly south along the western edge of lsd 7, then in a southeasterly direction following a natural draw (as shown in Figure 2). Dome stated it attempted to follow the north edge of the natural draw so as to reduce the land severance and inconvenience caused by an access road.

Dome acknowledged during testimony that it had not considered all of the effects that the two proposed well sites and access roads could have on the intervener's farming operations.

Respecting the possibilities of directionally drilling the wells to the selected subsurface locations from other surface locations, Dome argued that directional drilling during the primary development stage is not in keeping with its policies for economic resource exploration.

Dome stated that consideration had not been subsequently given to relocating the well sites within the limits of the existing target areas nor to apply for special DSUs to accommodate the intervener's concerns regarding land use.

5.2 The Intervener's Views

The intervener stated he would prefer to see the proposed well sites located on the perimeter of his fields, thus ensuring that the well sites and access roads would have a minimal impact on removal of valuable Class 2 agricultural land from production. The intervener claimed such locations would avoid the inconveniance of farming with large implements around an obstruction in the middle of the field and also avoid the damage and wear on farm machinery during the crossing of the access roads.

Respecting the southeast quarter of section 10-56-6, the intervener pointed out that he had cleared and broken approximately 31 acres (12.5 ha) of land in the southeast corner of the quarter, thus bringing 153 acres (62 ha) under cultivation. The remaining 7 acres (2.8 ha) are taken up with brush piles and a farm yard. In place of the proposed 7A-10 well site, the intervener proposed alternative locations, numbered 1 to 4 in order of preference as indicated in Figure 1. Each of these sites would provide Dome with the advantage of minimum access road to construct and maintain.

The intervener's first preference in the extreme northeast corner of lsd 8D-10 would result in the least effect on farming operations. For his second preference in the extreme northwest corner of 7C-10, the access road could run parallel to the north boundary of lsds 7 and 8 and thus avoid interruption of east-west farming operations. The third preference in the extreme northeast corner of 7D-10 would have advantages similar to 7C-10. His fourth preference on the extreme eastern edge of 8A-10 is just north of an existing farm yard on the perimeter of the field.

Respecting the southeast quarter of section 7-56-6, the intervener stated he had recently cleared and broken approximately 28 acres (11.3 ha) of land in the northwest corner of the quarter, bringing the entire quarter section, except 4 acres (1.6 ha) in the southwest corner of lsd 7B-7, under cultivation. In place of the 7A-7 well site, the intervener proposed three alternative locations in order of preference, numbered 1 to 3 on Figure 2. Each location would provide Dome the advantage of minimum access road to construct and maintain.

His first preference, in the extreme southeast corner at 1A-7, would result in minimal impact on farming. His second preference, in the extreme northwest corner of 7C-7, contained some bush which caused reduced crop yields. His third preference in the extreme southeast corner of 8A-7, had advantages similar to his first preference.

The intervener concluded there were several alternative locations for each of the applied-for well sites that should be considered by the applicant, that would lessen to a significant degree the impact on farming operations. Conversely, the present applied-for well sites would create obstacles and disrupt the intervener's present orderly business of farming.

5.3 The Board's Views

With regard to the 7A-10 location, the Board notes that, while the applicant re-routed the access road to reduce the severence to the intervener's field, it appears that this would still pose some inconvenience to the farming operations. Also, as there appear to be alternative sites of equal geological merit, other such locations that might reduce the impact on farming operations probably should have been considered in consultation with the landowner.

Similarly, the Board notes that the proposed 7A-7 well, particularly the access road, poses some problem for farming operations, and that there are other potential locations of equal geological merit that may reduce impact on farming.

The Board concludes that the applicant has not given sufficient consideration to such options or to the potential effects on farming operations and the manner in which those effects might be minimized prior to submitting well licence applications.

6 DECISION

The Board denies the application by Dome Petroleum Limited to reinstate the licence for the well, Dome et al Lindbergh 7A-10-56-6 W4M, and revokes well Licence No. 88984. Also, the Board denies the application of Dome Petroleum Limited for a licence to drill the proposed well, Dome et al Lindbergh 7A-7-56-6 W4M.

The Board emphasizes that revoking the 7A-10 well licence and denial of the 7A-7 well licence is without prejudice to any future properly documented well licence application on these lands that Dome may choose to file, including adequate consideration for positioning of well sites and access roads as they may affect agricultural land.

DATED at Calgary, Alberta, on 24 July, 1981.

ENERGY RESOURCES CONSERVATION BOARD

G J DeSorcy
G. J. DeSorcy, P.Eng.
VICE CHAIRMAN

C. J. Goodman
C. J. Goodman, P.Eng.
BOARD MEMBER

N Strom
N. Strom, P.Eng.
BOARD MEMBER

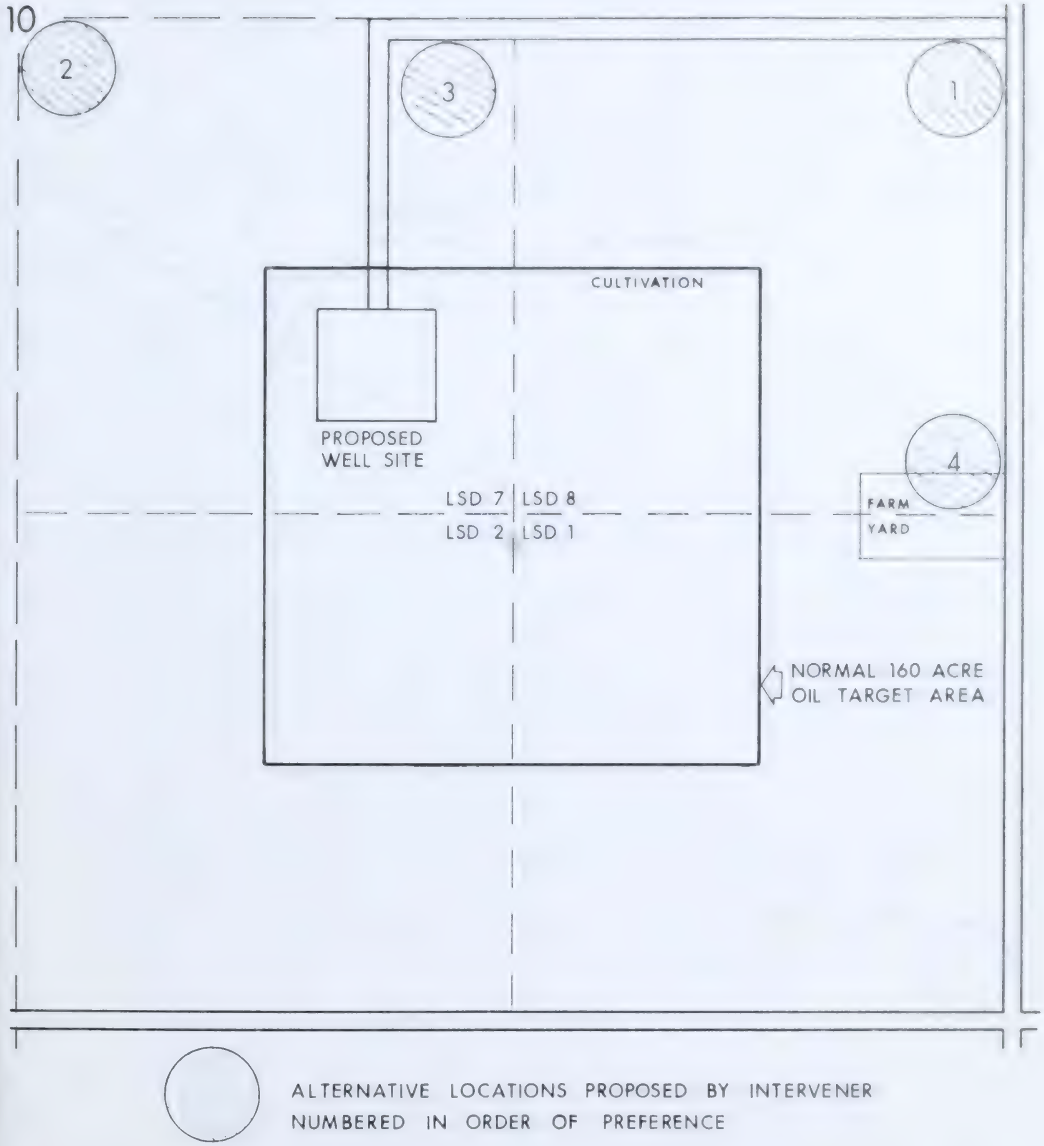
10
2
3
1
4
CULTIVATION
PROPOSED WELL SITE
LSD 7
LSD 8
LSD 2
LSD 1
FARM YARD
NORMAL 160 ACRE OIL TARGET AREA
ALTERNATIVE LOCATIONS PROPOSED BY INTERVENER NUMBERED IN ORDER OF PREFERENCE

FIGURE 1 DOME et al LINDBERGH 7A-10-56-6-4 PROPOSED WELL SITE

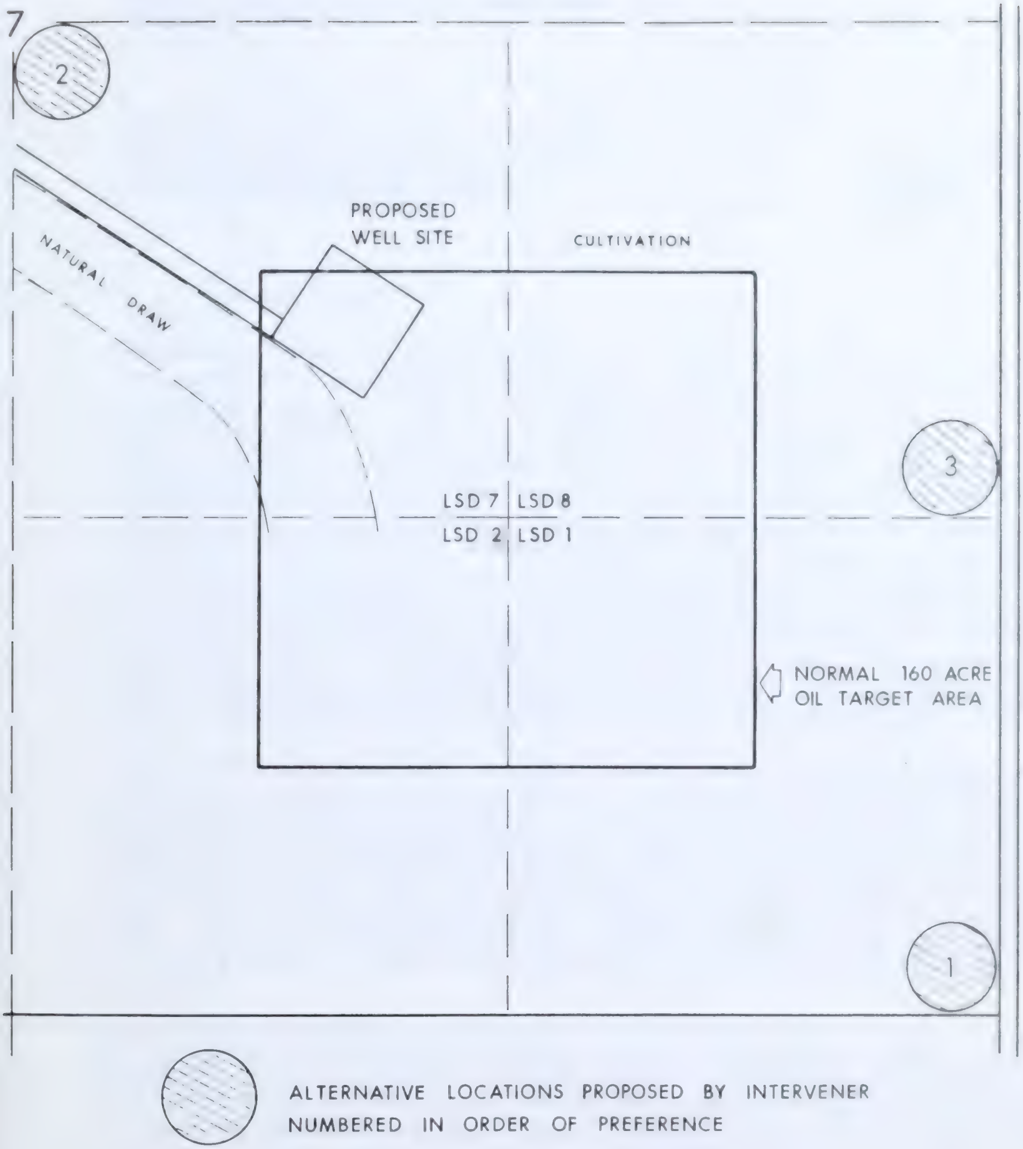
7
2
PROPOSED WELL SITE
CULTIVATION
NATURAL DRAW
3
LSD 7
LSD 8
LSD 2
LSD 1
NORMAL 160 ACRE OIL TARGET AREA
1
ALTERNATIVE LOCATIONS PROPOSED BY INTERVENER NUMBERED IN ORDER OF PREFERENCE

FIGURE 2 DOME et al LINDBERGH 7A-7-56-6-4 PROPOSED WELL SITE

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

APPLICATIONS FOR PERMITS TO CONSTRUCT
PIPELINES AND RELATED FACILITIES
IN THE EDMONTON-SKARO AREA

Decision 81-19
Applications 800741,
800742, and 800883

1 INTRODUCTION

The Energy Resources Conservation Board (Board) received three applications for permits to construct pipelines from the Scotford and Skaro areas to northeast Edmonton. Two of the applications were filed by Alberta Energy Company Ltd. (AEC), both being segments of the proposed Cold Lake to Edmonton bitumen pipeline transportation system; one for the transmission of crude bitumen blend from the Skaro area to northeast Edmonton and the other for the transmission of diluent from northeast Edmonton to the Skaro area. The application by Shell Canada Limited (Shell) was for two pipelines for the transmission of gasoline and distillates from the Scotford refinery area to the inter-provincial pipeline terminal area at Edmonton, and eight relatively short pipeline segments for the transmission of a variety of refined and semi-refined products, including natural gas liquids to the Fort Saskatchewan cavern storage area and for the movement of products between pipeline terminal facilities in the northeast Edmonton area.

The Board considered only the area from Skaro to a point northeast of Aikenside in section 31, township 53, range 22, west of the 4th meridian (Point K) in these proceedings, and those sections of the AEC and Shell pipelines to the southwest of Point K were deferred. These and other routes to the south and west of section 31-53-22 W4M will be considered at a Board Inquiry, Proceeding No. 810385, scheduled for 15 September 1981. The routes of the pipelines in the applications by AEC and Shell, and the portion for which consideration was deferred are shown in Figure 1.

At an earlier hearing held in Edmonton on 20-22 January 1981, the Board approved, in part, applications by AEC for a crude bitumen pipeline and a diluent pipeline between Cold Lake and Edmonton. Approval was for the route from the Esso Resources Limited Leming pilot project near Cold Lake to a point near Skaro in Lsd 3-29-57-19 W4M, and a decision on the remainder of the route was deferred. The necessity and technical merits of the AEC applications were considered at this hearing, and these matters are fully addressed in Decision Report 81-7. They will not be part of the present report.

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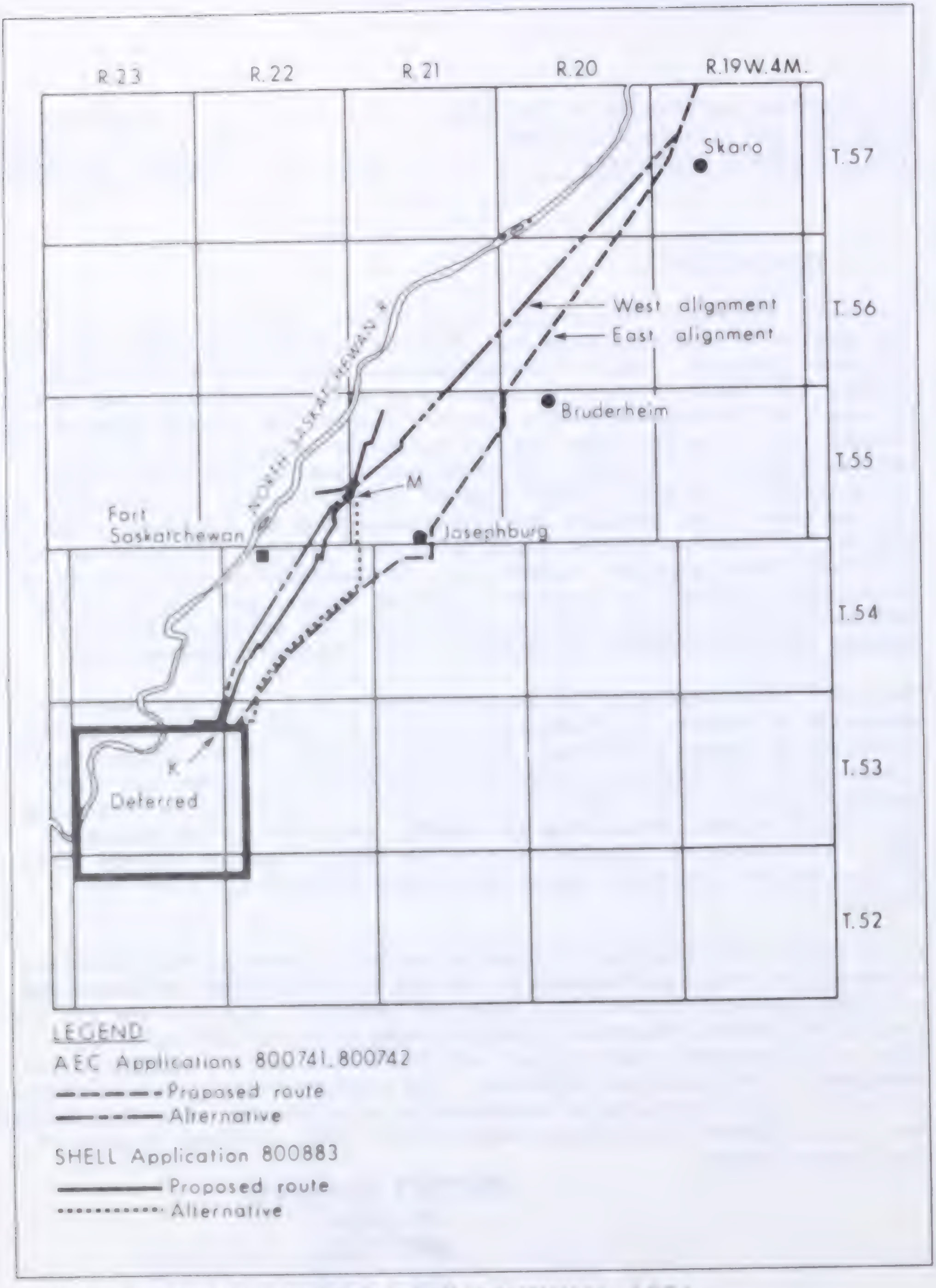

FIGURE 1 EDMONTON-FORT SASKATCHEWAN AREA

Although the application by Shell did not fully address all technical considerations, the application was submitted with the basic intention of establishing an acceptable route, and later establishing detailed technical design for the approved route.

2 HEARING AND APPEARANCES

A hearing to consider these applications was held in Edmonton on 10 July 1981 with G. J. DeSorcy, P.Eng., V. E. Bohme, P.Eng., and N. Strom, P.Eng., sitting. Those who appeared at the hearing are identified in Table 1, in the Appendix to this report.

3 THE AEC APPLICATION

AEC applied for a permit to construct approximately 65 kilometres of 323.8 mm O.D. pipeline from the Skaro area to the "refinery row" area in Edmonton. The pipeline would transport a crude bitumen-condensate blend into Edmonton, and would be a continuation of the pipeline previously approved by the Board under Permit 19113. Concurrently, a second application was filed for construction of an adjacent 65 kilometres of 168.3 mm O.D. pipeline to transport condensate in the reverse direction. It would tie-in to the pipeline previously approved by the Board under Permit 19112. The preferred routes of both pipelines are shown in Figure 1, and follow the location identified as the east alignment.

Both pipelines would be built at the same time and would be laid in a common ditch. The preferred route originates at a point in Lsd 3-29-57-19 W4M and proceeds generally southwesterly, passing west of Bruderheim to begin parallelling the Canadian Pacific railway. It follows the railway to a point near Aikenside at Lsd 3-31-53-22 W4M (Point K).

The applications are for parts of the pipeline system intended to serve the existing and future requirements of producers in the Cold Lake region for transportation of crude bitumen to markets in Edmonton, planned to become operational by January 1982.

4 THE SHELL APPLICATION

Shell submitted a proposal and alternative routes for permits to construct a system of pipelines to transport and distribute products from its planned refinery near Scotford to the Edmonton interprovincial pipeline terminal area. At the Scotford refinery, 8.85 kilometres of twin 114.3 mm O.D. parallel pipelines would move propane and butanes from the refinery to underground storage caverns near Fort Saskatchewan, and a similar size and length of pipeline would deliver natural gas liquid feedstocks from the caverns back to the refinery. Gasoline and distillate oils would be transported some 37 kilometres in two adjacent pipelines, 219.1 mm O.D. and 273.1 mm O.D. respectively, to a Light Oil Tankage Terminal (LOT) adjacent to the Inter-Provincial and Trans Mountain pipeline terminals in northeast Edmonton. The Edmonton area portions of the system, deferred to a future hearing, would include twin 457 mm O.D. products pipelines from the LOT for a distance of 1.53 kilometres to the Interprovincial terminal, and similarly through two parallel 323.9 mm O.D. pipelines to the Alberta Products Pipe Line terminal 4.35 kilometres away. A fifth pipeline, 273.1 mm O.D. in size and 1.53 kilometres long, would deliver a special blend feedstock of semi-refined products from the LOT to the Trans Mountain terminal.

During the course of the hearing, Shell indicated that a change in arrangements for upgrading the natural gas liquids from the refinery would now only require one pipeline instead of three, and would carry a mixture of propane and butanes to the underground storage.

Shell's preferred route from Scotford to Point K, called the west alignment, is parallel and adjacent to a group of pipelines serving the general Fort Saskatchewan industrial area, while the alternative would be parallel to a portion of the AEC preferred route running adjacent to the CP rail line right of way to a point near Josephburg then northward to the Scotford refinery.

5 INTERVENTIONS

NUL supported the AEC preferred east alignment and indicated that it intended to file application for a parallel alignment for a high-pressure gas line both to service the new Celanese Canada methanol plant and to provide another source of gas to Edmonton.

The ERPC presented an excerpt from its 81 01 07 minutes indicating support for the "corridor" concept in general, and endorsing their use. Although the ERPC voiced approval for both the east (AEC) and west (Shell) alignments, it pointed out that the potential development of the Town of Fort Saskatchewan could cause some problems for the west alignment.

Three other interveners voiced concerns relative to specific land holdings, and requested the Board to consider route locations that would avoid potential adverse effects. On this basis, First City opposed the west alignment, while the two other interveners, Dr. Shirvell and Dr. Simmons, opposed the east alignment.

6 THE ISSUES

The Board considers the major issues of the applications to be:

(a) the need for the Shell pipelines,
(b) the necessity (in the public interest) for a single corridor,
(c) the route(s) of the applied-for pipelines,
(d) environmental impacts and the merits of special procedures during pipeline construction, and
(e) technical details of the applications.

7 NEED FOR THE SHELL PIPELINES

Unlike the Shell application, the need for the AEC pipelines was considered at an earlier hearing, and the Board determined then that there was such a need in its Decision Report 81-7. It therefore was not an issue in the present proceedings.

In supporting the need for its proposed pipelines, Shell recounted the background of the synthetic crude oil refinery it is building at Scotford, and the marketing plans for the products. It stated that an essential part of the scheme included a marketing terminal in the "refinery row" area of northeast Edmonton, as well as associated pipelines to transport finished products, gasolines, distillates and jet fuel from the refinery to the marketing terminal and distribution to nearby inter-provincial pipeline transmission systems.

Based on the arguments of Shell, and noting that none of the interveners challenged the need, the Board is satisfied that the pipelines, as applied for by Shell, are required.

8 THE SINGLE CORRIDOR CONCEPT

The Board heard only limited evidence regarding the desirability of using a single alignment for both pipeline applications. In closing argument, AEC indicated that both the east (AEC) and west (Shell) alignments satisfied the general corridor concept and warranted approval in the public interest. Shell acknowledged that while its proposed west alignment would be adjacent and parallel to a set of pipelines - a defacto corridor - that the west alignment could theoretically accommodate only a few more lines before reaching a prescribed maximum width, after which a new corridor alignment would have to be devised for additional pipelines.

The Board's general view is that where a multiplicity of pipelines is required to traverse a broad similar route, such as is evident for the "refinery row" to Skaro area, the over-all impact on land use might be effectively minimized by confining the pipeline alignments to a common corridor. On the other hand, the need for laterals to enter and exit such corridors may reduce the initial benefits. In the case in hand, the Board sees partial fulfillment of the corridor concept in both the AEC east alignment, adjoining the CPR rail right of way, and the Shell west alignment adjoining existing multiple pipeline rights of way serving the general Fort Saskatchewan industrial areas. As a result, notwithstanding the Board's general endorsement of the use of pipeline corridors, in this particular instance it sees some advantages in a single corridor but they are not as great as to dictate that all lines must go in the same corridor.

9 PIPELINE ROUTES

9.1 Views of AEC

AEC voiced a number of reasons for its preference for the eastern alignment including the following:

- it parallels an existing major linear surface disturbance (CPR railway), forming the basis for a utility corridor;
- it is environmentally less sensitive than the western alignment for the portion from Bruderheim to Skaro;
- generally, it would have less potential impact on historical resources;
- it avoids potential future urban growth situations near Fort Saskatchewan;
- it is near the Petalta project location, and would therefore be more accessible for pipeline requirements to and from the plant;
- since its planning was well advanced on its preferred route, early approval thereto would allow construction to proceed prior to the winter, leading to a saving in construction costs and permitting optimum control of land disturbance and reclamation.

The company concluded its arguments by stating that since its proposed right of way plus those of Shell and NUL could add up to a significant width of land, and should the Board find it desirable in the public interest to approve only one corridor alignment for all these pipelines, it should be the eastern alignment because of the space available there.

9.2 Views of Shell

Shell stated that in general, its route selection process was based on minimizing land impact and minimizing costs. Shell pointed out that the western alternative was best suited to its purposes because it was the shorter of the two routes, was adjacent to eight existing pipelines, and had adequate right of way space to service pipeline needs of the Shell Scotford refinery. It believed that the costs owing to the additional length of pipeline on the alternative route, and also the related need to traverse lands where there are now no pipelines or other natural corridor features constituted significant disadvantages that could be avoided by its preferred western route.

On the matter of proximity to Fort Saskatchewan, Shell indicated that it had discussed the subject with planners, landowners, and the Town of Fort Saskatchewan. Apart from some minor site-specific problems pointed out by landowners, it anticipated no significant difficulties in proceeding along the route selected. Shell believed that the reason for this general acceptance was the fact that several pipelines exist there now, and are in areas designated as "industrial" in the General Municipal Plan.

In summing up its position, Shell saw merit in accepting both the AEC (eastern) and Shell (western) alignments, but indicated its preparedness to pursue the eastern alignment with a north lateral if the Board concluded that would be in the public interest.

9.3 The Interveners' Views

Generally, interveners took the position that the route selection should be made so as to minimize or negate any effects that might impact on their specific properties.

First City,which owned or held options on six quarter-sections of land east of the Town of Fort Saskatchewan, opposed the Shell (western) alignment on the basis of potential interference with future urban growth areas of Fort Saskatchewan. It alluded to the possible public concern regarding the safety of pipelines adjacent to urban-type settings, and indicated that the public interests would be better served by having the pipelines on agricultural lands. It was First City's contention that such property is not as severely impacted, since agricultural activities can be resumed over farmland where there are buried pipelines. In conclusion, First City opposed the western alignment and strongly supported the eastern alignment as fulfilling those objectives.

The ERPC, in its brief, included a copy of an excerpt from the minutes of a meeting which expressed support for the AEC preferred route. However, in evidence, it indicated that both routes, according to the ERPC's Policy Paper No. 10 on pipelines and power lines, could be considered corridors since linear surface disturbances already existed along both routes, viz, on the west, an existing set of pipelines; on the east, the CP railway.

An intervention by Dr. Shirvell on the application by AEC addressed mainly two issues; firstly, opposition to the eastern alignment across his property and secondly, if the eastern alignment were selected, that the Board take appropriate action to minimize construction impact, and ensure sound land-reclamation. With regard to mitigation of impact on land and farming operations, it was suggested by Dr. Shirvell that an independent agrologist should be retained by the Board to supervise topsoil stripping and reclamation, and to stop construction during periods of inclement weather when such construction activity would detrimentally affect the soil-conservation program. In summary, he supported the western alternative route, believing that it would have potentially less adverse impact on land use than would the eastern alignment. Dr. Simmons strongly supported Dr. Shirvell's stand on the impact of pipelines on agricultural land, implied that her neighbours shared her concerns, and concluded that she favoured the western alignment.

NUL provided a map showing a prospective pipeline route intersecting the eastern alignment in section 25-54-21 W4M from the east and then following the CPR eastern alignment to the Aikenside area. As a result, NUL indicated that it would prefer the eastern alignment if the Board was considering a single corridor.

9.4 The Board's Views

The Board believes that in addition to normal land use and environmental criteria, two essential and closely-related criteria should be emphasized in the selection of pipeline routes in the congested area between Skaro and Edmonton:

(1) to make maximum effective use of land parallelling established linear disturbances and, conversely,

(2) to minimize the length of new "non-corridor" rights of way.

The Board has carefully reviewed the evidence and believes these criteria and the public interest can best be served by permitting each pipeline to follow the nearest corridor available; in effect by approving the preferred route of each applicant. In arriving at this conclusion, the Board considered three alternatives, listed as follows:

A - the AEC and Shell pipelines to follow the respective east and west preferred alignments;

B - all pipelines to follow the AEC eastern alignment; for this, the Shell pipelines would follow its preferred route from the Scotford refinery to Point M, and thence southward to intersect the AEC eastern alignment;

C - all pipelines to follow the Shell western alignment.

Scheme A Because of the existing major linear surface disturbances along each of the applicants' preferred routes, the Board believes there is merit in making use of both established corridors. This would eliminate the need for any non-corridor right of way for the Shell pipeline and minimize that required for AEC. In addition, it would also provide flexibility in both the Fort Saskatchewan and Bruderheim areas. The apparent disadvantage - that of departing from a "one-corridor" concept - does not apply in this case, since both corridors are already established. The Board recognizes that by approving the Shell pipelines in the western alignment, First City's land would be affected to some degree. In the Board's view, the incremental impact of adding two pipelines to the eight already across these properties would not be so significant as to cause the placement of the Shell lines elsewhere.

Scheme B The Board recognizes that the eastern alignment parallels the CPR railway for about half the length of the Edmonton to Skaro route, and would thus minimize land severance. It has the advantage of being relatively close to the proposed Petalta project at Bruderheim, and of having the space to accommodate a new major pipeline corridor. However, it has the disadvantage of being relatively far from the Shell Scotford refinery and would require four miles of new, non-corridor right of way to connect to the "railway corridor".

Scheme C The main advantage of the Shell western alignment is that it would parallel a number of existing pipeline rights of way. The main disadvantages are that any future pipeline corridor potential is limited owing to space limitations, and the alignment lies near potential future urban growth areas of Fort Saskatchewan.

The Board notes that AEC applied for a 30-metre width of right of way which is considerably more than the requirements for the placement of its two pipelines. The Board, however, concurs with the acquiring of this extra width because of the prospects for future lines to locate along the same route. The Board would expect AEC and others who are planning pipeline alignments to consider, where feasible, the joint use of unused portions of rights of way in order to reduce the impact on landowners' use of their land.

10 ENVIRONMENTAL CONSIDERATIONS AND SPECIAL CONSTRUCTION PROCEDURES

10.1 The Intervenors' Views

To prevent serious adverse impacts on future agricultural land capability, Dr. Shirvell outlined a set of procedures that he proposed be adhered to during construction of the pipeline and subsequent reclamation. His overall objective was to ensure that the valuable CLI No. 1 soils that extend through much of the area are fully protected during the construction and subsequent topsoil restoration processes. A key requirement of this objective would be the assignment of a qualified soil-science agrologist to oversee the topsoil stripping and management program. Dr. Simmons expressed support for Dr. Shirvell's views.

10.2 The Applicants' Views

Both Shell and AEC argued that the lengthy list of conditions suggested by Dr. Shirvell should undergo thorough study before accepting them as conditions of a Board permit, since a number of them might not be warranted. AEC further indicated that virtually every recommendation made by Dr. Shirvell was covered in the Environmental Protection Plan filed by AEC. Both companies agreed that most of the impact on agricultural lands could be avoided if pipeline construction could be completed before winter conditions set in.

10.3 The Board's Views

In considering agricultural impacts, the Board notes that although the western route is approximately 1.2 kilometres shorter than the eastern route, the difference in the amount of agricultural land traversed is not substantial. AEC indicated that about 85 per cent of the western route traverses agricultural lands as opposed to 91 per cent along the eastern route.

The Board agrees with Dr. Shirvell that careful measures are required to ensure that pipeline construction and the reclamation procedures do not have a detrimental effect on the high quality agricultural lands in these areas. However, the Board believes that ascribing a list of specific conditions to the pipeline would be an unnecessary duplication of the Development and Reclamation Approval issued by the Department of the Environment for the same pipeline. The latter includes specific conditions and required procedures for conservation and careful restoration of topsoil following completion of pipeline construction.

Specifically, the Board disagrees with Dr. Shirvell that an independent agrologist should be hired to oversee the construction projects. However, the Board is of the view that a resident soil-management expert should be retained by each of the applicant companies to oversee, monitor, and advise on specific topsoil conservation procedures during the construction and reclamation phases. These experts would also then be available to deal with the concerns of individual landowners, and to maintain close liaison with local Alberta Environment Reclamation Officers and ERCB pipeline and environment protection agricultural personnel.

11 TECHNICAL DETAILS

11.1 AEC

The Board reviewed the overall technical details of the AEC proposal in the hearing in Edmonton on 20-22 January 1981 and expressed its concurrence with the design in Decision Report 81-7. The Board notes that this design will essentially prevail for the applied-for pipelines, with special provisions for anchors, stream crossings, and mainline valves. The Board is satisfied that the design meets all applicable codes and standards with respect to these matters in particular and the overall design in general.

11.2 Shell

The Board notes that Shell stated its application is deficient in certain engineering design details in order to focus on urgent matters of routing and right of way considerations. It asked the Board to forego details of engineering design until a route was approved, at which time more precise engineering factors could be applied. The Board accepts this approach, and will require technical details to be filed with the Board with respect to the approved route.

12 CONCLUSIONS

The Board believes that the east alignment preferred by AEC and the west alignment proposed by Shell are both suitable pipeline corridors for their respective purposes. Also, the advantages of combining the two pipeline alignments into one corridor do not appear to be sufficient to offset attendant disadvantages.

The Board has considered the impact from a safety point of view and believes that neither individually or collectively, in either case, do the pipelines present any undue risk.

The Board will require Shell to provide, in written form, technical and design information in sufficient detail to satisfy all outstanding matters in this regard. Such information will be a prerequisite to the issuance of permits and licences to Shell. Upon receipt of the technical and design information, the Board intends to send copies to all hearing participants to advise them of a future meeting between Board staff and Shell to discuss the contents.

13 DECISION

The Board approves Applications 800741 and 800742 of AEC for its preferred route along the east alignment; and Application 800883 of Shell for its preferred route, subject to receipt of additional technical data.

ISSUED at Calgary, Alberta, on 5 August 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy
G. J. DeSorcy, P.Eng.
Vice Chairman

Bohme
V. E. Bohme, P.Eng.
Board Member

N. A. Strom, P.Eng.
Board Member

APPENDIX

TABLE 1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Alberta Energy Company Ltd. (AEC) J. W. Beames, Q.C.	J. E. Ellefson, P.Eng. J. H. Russell, P.Eng. R. A. Nemeth, P.Eng.
Shell Canada Limited (Shell) R. M. Curtis	P. E. Boisseau, P.Eng. R. J. Lamarr, P.Eng. G. R. Ursenback, P.Eng.
First City Developments Ltd. (First City) R. D. Schachter	
Melvin Marler	
Edmonton Regional Planning Commission (the ERPC) R. Vogelesang	R. Vogelesang
Dr. C. S. Shirvell P. A. Smith	Dr. C. S. Shirvell
Dr. H. Simmons	Dr. H. Simmons
Northwestern Utilities Limited (NUL) B. Zalmanowitz	E. F. Provost, P.Eng. H. E. Allen, P.Eng.
Alberta Environment (AE) R. Dyer D. Braton, P.Eng.	
Energy Resources Conservation Board staff (Board staff) R. J. Allman, P.Eng. M. J. Bruni G. C. Dunn, P.Eng.	

Those who tendered submissions but did not appear at the hearing included Walter Chimera, Henry B. Lievers, Johannes Prinz von Thurn und Taxis, Bruce M. Robertson (Robertson Food Consultants Ltd.), Mary Taylor, Chevron Standard Limited, and the City of Edmonton.

Mr. Marler withdrew his submission during the hearing.

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

DRILLING SPACING UNIT TARGET-AREA REQUIREMENTS
FOR OIL AND GAS WELLS DRILLED IN THE
PROVINCE OF ALBERTA

Decision 81-20
Proceeding 810078

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1 THE APPLICATIONS

The Energy Resources Conservation Board (Board) received an application by Unifarm, an organization of Alberta farmers, to consider a change in the current target-area requirements to provide for target areas in the corners of quarter sections for oil and gas wells in the balance of the white and yellow areas of Alberta[1] (see Figure 1) not covered by subsisting corner target-area provisions.

The Board also received applications by the Smoky River Surface Rights Society and the Bonanza and Districts Surface Rights Association to consider a change in the current target-area requirements for oil and gas wells to the corner of quarter sections in the specific areas outlined on Figure 2. The Board has dealt with these applications in a separate report, Decision 81-21, which is being released concurrently with this report.

The Board was aware that other surface rights associations were preparing similar applications.

The Board held a public hearing of the applications in Edmonton on 16 March to 20 March 1981 with G. J. DeSorcy, P.Eng., C. J. Goodman, P.Eng., and N. Strom, P.Eng., sitting. The notice of hearing called for representation concerning:

- changes that might be desirable, and
- implementation of any such changes, including application in already developed oil and gas pools and adjacent lands.

Appendix I lists the parties who appeared at the hearing and Appendix II lists those who made written submissions but did not appear or were not represented at the hearing. The Alberta Department of Agriculture filed a submission, pursuant to section 26 of the Board's Rules of Practice.

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[1] Alberta Energy and Natural Resources designates white, yellow, and green areas as shown on the Public Lands General Classification Map.

At the commencement of the hearing, Amoco made a motion to adjourn to allow it sufficient time to analyze the submissions of the farm groups, and to adequately prepare its evidence, because the concept of changing oil and gas target areas is a complex issue, including conservation, correlative rights, and equity. As an alternative, if the Board were to proceed with the hearing, Amoco suggested that the hearing should be held in two parts; the first part dealing with the submissions of the agricultural groups and the second part dealing with the oil industry submissions which could be held at a later date. Several oil industry representatives spoke in favour of the Amoco motion while a number of agricultural groups opposed the motion. The Board denied the Amoco application on the grounds that sufficient notice had been given and that the subject had been investigated to a considerable degree over the past few years.

2 BACKGROUND

2.1 History of Spacing Changes

Spacing and target regulations originated in Alberta in 1926 when The Mineral Act specified a distance of 400 feet (ft) [122 metres (m)] between wells. In 1938, this distance was changed to 1320 ft (402 m) when fields such as Turner Valley and Taber were actively developed. In 1949, a standard drilling spacing unit (DSU) of one legal subdivision (Lsd) for oil wells was defined with a target area 330 ft (100 m) from the boundaries of the Lsd. The standard DSU for a gas well was defined as one section with the target area 1650 ft (500 m) from the sides of the section.

One-Lsd DSUs for oilwells were still in effect when the first major discovery was made in Leduc in 1947 and the development of such major fields as Redwater, Acheson, Stettler, Bonnie Glen, and Wizard Lake occurred.

As drilling techniques improved and deeper wells were drilled, especially in the western part of Alberta, it became apparent that larger reserves per well were necessary to provide for an economic return with increased drilling and development costs. Furthermore, experience gained from the existing oilfields indicated that the area from which oil would flow towards wells, which is commonly referred to as the drainage area, was much larger than one Lsd. Therefore, to add a stimulus to continued exploration, the standard DSU for oilwells was increased in 1957 to two Lsds for all lands West of the 5th Meridian. The target area was commonly located in the even-numbered Lsd and was identical in size and orientation to that of a one-Lsd DSU.

During the late 1950s, oil production capacity developed much faster than demand and, in an attempt to avoid overdevelopment, quarter-section DSUs for oil were established as the standard size for all undeveloped lands throughout the province effective 1 June 1962. The target area was restricted to a square 330 ft (100 m) from the sides of the southwest Lsd of the quarter section. As a further means of decreasing the number of wells during initial development of large-area pools, oil DSUs of one-half section were established in pools such as Pembina, Willesden Green, and Swan Hills.

An improvement to the concept of drilling and operating only the number of wells needed to drain the pool was introduced in 1964 with the introduction of the production spacing unit (PSU). In accordance with a set of rules, this concept permits the combining of several adjoining DSUs to form a PSU with a somewhat centrally-located producing well. This provision was used to considerable advantage to allow the shutting in of wells in overdeveloped fields and it permitted very wide flexible spacing during development of pools such as Mitsue.

As the continuing search for oil and gas reserves proceeded into the green areas of the province, increasing flexibility to locate wells became more important to reduce road-building costs and the impact on the environment. It was expected that enlarging the target area for a quarter-section oil DSU and a one-section gas DSU would provide for a lesser degree of restriction in locating a well on target for both gas and oil production. Hence, on 1 January 1968, the Board introduced a central target area for the normal quarter section oil well 660 ft (200 m) from the sides of the quarter section and equivalent in area to some 40 acres (ac) [16 hectare (ha)]. The central target area for a one-section gas well was extended on the same date and consisted of the four central Lsds. These target areas for both oil and gas wells are shown on Figure 3.

These enlarged central target areas seemed to provide the industry with the needed flexibility, since relatively few problems were encountered with well locations. However, with the advent in the early 1970s of a very large shallow gas development in southeastern Alberta on quarter-section gas DSUs, it became apparent that a solution had to be found to minimize the interference between rapidly expanding irrigation operations and oil and gas well installations.

Following a hearing in Brooks in 1974, the target area for oil DSUs and smaller than one-section gas DSUs was changed effective 1 June 1974. As shown in Figure 4, the target areas were not decreased in size but were relocated to a suitable corner of the DSU to minimize interference with irrigation operations. The area where this change was implemented is located south of township 31 and east of the 5th meridian. The corner target locations for these lands are specified in Board Order No. SU 800 and therefore are commonly known and referred to in the petroleum industry as the "SU 800" area or "SU 800 target areas".

In 1976, the Board was approached by the Farmers' Advocate and Unifarm to consider the possibility of extending the "SU 800" concept of corner target areas to other parts of the province. The Board considered the requests at a hearing in April 1977. The Board, in Decision 80-8, decided not to shift target areas to corners for the remainder of the province, but did make the following changes:

(a) to improve the flexibility and the opportunity to solve land-use problems, the target area for one-section gas DSUs was further enlarged by 330 ft (100 m) in all directions. Figure 5 illustrates the expanded gas target area and the normal quarter-section oil DSU target area. Figure 6 shows the expanded gas target area and the quarter-section oil target areas within the "SU 800" area, and

(b) applications by either surface owners, farm organizations, or the oil industry to establish a special target area suitable for a specific area, could be made and would be considered by the Board.

In accordance with (b) above, the Board held a hearing at Grande Prairie in 1980 concerning a request for corner target areas for quarter-section oil DSUs and one-section gas DSUs for lands in townships 69 to 76 and ranges 1 to 13, west of the 6th meridian.

The Board determined from the evidence presented that a shift of the gas target was not warranted. However, in the Board's view, the method of farm operations in the area justified the implementation of a corner target area for quarter-section oil DSUs. Although the resulting target areas are similar in size to those in the "SU 800" area, the Board introduced a further modification by prescribing both a primary and a secondary target area. The primary area for a one-section gas DSU consists of the northeast quadrant of Lsd 6, and the secondary area is the remainder of the standard target area. For a quarter-section oil DSU, the prescribed target area is the northeast Lsd. The primary target area comprises the northeast quadrant of the northeast Lsd of the quarter section and the secondary target area thus becomes the remainder of the prescribed target areas. These target areas are illustrated in Figure 7 and have since become known as the "Grande Prairie" target areas.

In the same Decision, the Board decided that, where oil wells were drilled on half-section spacing, the target areas would be consistent with those prescribed for quarter-section spacing. On the other hand, where oil wells would be drilled on closer than quarter-section spacing, the Board decided to shift the target area to the northwest quadrant in an effort to maximize the number of wells which would be along fence lines. Figure 8 illustrates this spacing which is applicable in the "Grande Prairie" area.

2.2 Summary of Current Well Target Provisions

The provisions of DSU target locations and areas applicable today may be summarized as follows:

(a) the corner target provisions as illustrated in Figure 4, for oil DSUs and gas DSUs of less than one-section in the "SU 800" area (South of township 31 and east of the 5th meridian).

(b) the corner and fence-line target provisions as illustrated in Figures 7 and 8, for oil and gas wells in the "Grande Prairie" area (townships 69 to 76 and ranges 1 to 13, west of the 6th meridian), and

c) the central target provisions as illustrated in Figure 5, for standard one-section gas DSUs and quarter-section oil DSUs for all undeveloped lands throughout the remainder of the province, excluding the "SU 800" and "Grande Prairie" areas and those areas subject to local SU orders.

3 ISSUES

The Board considers that the main issues respecting oil and gas well target provisions for the province as a whole are:

- the advantages and disadvantages of changing the currently standard central target area provisions, and
- if there is overall merit to making changes,
  - (i) the new target provisions that should be adopted, and
  - (ii) the timing of implementation.

4 THE ADVANTAGES AND DISADVANTAGES OF CHANGING THE CURRENT STANDARD CENTRAL TARGET AREA PROVISIONS

4.1 Agricultural Industry

Unifarm contended that the location of wells in the middle of fields results in substantial inconvenience, extra work time, a safety hazard, and increased costs to the agricultural industry. Unifarm expressed concern over the land removed from agricultural production or subjected to reduced productivity due to centrally located well sites and lengthy access roads, and the problems of restoring those lands to normal crop production following well abandonment. Unifarm suggested that aesthetic factors of a well site are more difficult to improve upon in the middle of a field than on the periphery. Locating oil and gas wells in the corner of quarter sections would be preferable to landowners and would increase the probability of the owner of a well and the landowner coming to terms privately. Unifarm maintained that various arrangements are available to the petroleum industry in the form of pre-drilling agreements and unitization to alleviate problems of correlative rights and drainage.

The Cattle Commission reiterated the agricultural land-management concerns of Unifarm, and submitted that well sites and access roads in the midst of grazing lands have a negative impact on cattle management by disturbing grazing patterns, subjecting livestock to noise and fright, and serving as an attraction which could result in hazardous consequences. The Cattle Commission expressed concerns over the opportunity for trespassing created by locating wells near the centre of lands. The noise, aesthetics, and interference with the relatively more intensive agricultural management found near the farmyard should be minimized by increasing separation distances and ensuring wells are not directly upwind of farmyards. The Cattle Commission suggested the Board should provide off-target penalty relief, and consider more seriously directional drilling procedures to accommodate the agricultural industry.

The Elk Point Association submitted that if wells were located along the perimeter or in the corners of fields and quarter sections, its primary concern of roads into the middle of fields would be eliminated and land conservation improved. The Elk Point Association suggested the application of directional drilling to reduce disruption of agricultural activities, especially where oil fields were to be developed on 40-ac or smaller DSUs.

A number of other groups presented submissions at the hearing generally supporting the contention that there would be substantially less impact on the agricultural industry if wells were located in the corner of quarter sections, along property boundaries, or adjacent to natural obstructions on the land. Included in this group were: Surface Rights Federation, Blindman Valley Association, Bluffton Association, Bonanza Group, Christian Farmers, County of Beaver No. 9, County of Leduc No. 25, Farmers Advocate, I.D. No. 19, Mountainview Group, M.D. of Bonnyville No. 87 and I.D. No. 18, M.D. of Sturgeon, Mr. O'Ferrall, Parkland Association, Smoky River Group, Three Hills Group, Warburg-Pembina Group, and Willow Creek Group.

Several agricultural industry participants suggested that the 100-m setback of the well from road allowances, other rights of way and farm dwellings should be reduced where it was safe, to enable wells to be located closer to the edge of agricultural lands.

The agricultural industry generally maintained that there would not be an increased impact of the proximity of well sites to farmyards than exists at present if corner target areas were adopted. Some landowners expressed the view that tolerating the nuisance of the drilling of a well near the farmyard for a short time period was less inconvenient than farming around a wellhead for many years.

Mr. O'Ferrall submitted that the most desirable location for a well need not be in the middle of a farmer's field if target areas and spacing were not set in advance of drilling and, there was ample opportunity to select the optimum well site having regard for both the surface and the mineral owners' concerns as well as conservation concerns. Mr. O'Ferrall suggested that maximum flexibility would exist in determining well locations if specific target areas were not set by the regulations.

4.2 Alberta Government Departments

Alberta Agriculture made a written submission under section 26 of the Rules of Practice of the Energy Resources Conservation Board.[1] It maintained that severance and inconvenience caused by current requirements for locating wells in the centre of fields have a great impact on farming operations and tended to reduce crop production.

Alberta Agriculture submitted that wells in the corners of fields would have less impact on the time available for seeding and harvesting, which are critical spring and fall operations where a few hours of delay could result in substantial crop loss. Comparing farming around a well site and a 1350-ft (411-m)-long access road for a well in the centre of a quarter section with a well site in the corner of a quarter section, it estimated the additional time for a parallel and a perpendicular farming pattern would be about 36 minutes and 97 minutes, respectively. The opportunity costs associated with this extra time, should weather conditions become critical to the timing could be significant to the farmer. In general, the further north in the province that the farm is located, the more acute the timing, of seeding and harvesting operations becomes. Alberta Agriculture stated that placing well sites close to municipal roadways significantly reduces the acreage of farmland consumed. The area to be reclaimed upon abandonment, the opportunity for trespass, interference with natural water drainage patterns, intrusion upon the land by overhead powerlines, the potential weed infestation of headland acreage, and the interference with irrigation practices would all be reduced if corner well locations were introduced.

Alberta Energy and Natural Resources, in a written submission, pointed out that corner well locations would decrease the overall impact of oil and gas facilities on the land base. A move to conserve the land and minimize the interference and disruption of other legitimate activities would be in the interest of good land, forest, and wildlife management.

4.3 Petroleum Industry

Dome submitted that by definition in The Land Titles Act, a mineral owner is a landowner in the same manner as a surface owner. It therefore contended that wells should be located in the centre of a DSU to protect the equity of the mineral lease owner, to permit optimum exploration and the production of minerals discovered on the whole of the parcel. Dome submitted that it is seriously concerned about the potential impact of mixed target areas which would result if a change of target area were made in existing developed pools. It submitted that the results of a model reservoir study assessing the effects for a five-spot waterflood pattern, with the injection well centred as compared with the injection well moved one-half the distance to one side of the pattern or moved all the way to the edge of the pattern, indicated recovery losses through reduced sweep efficiency of one-tenth and one-fifth respectively. For an actual pool, however, Dome said the relative losses could be less than indicated in the study, as patterns around the periphery of a pool may be incomplete and slightly skewed patterns exist anyway because wells are located in different portions of their target areas.

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[1] Section 26, Rules of Practice of the Energy Resources Conservation Board states "Where the Board receives a statement by a department or agency of the Provincial government and a copy thereof is supplied to the applicant and each intervener, it may, notwithstanding the other provisions of these Rules, receive the statement in evidence, whether or not it is filed or presented in accordance with these Rules."

Dome stated that the Bonanza Boundary A Pool (Bonanza pool) demonstrates potential effects of non-uniform patterns and incomplete patterns in the extreme. First, the pool is long and narrow, resulting in substantial perimeter area losses. Second, due to the central half of the reservoir having extremely poor accessibility because of topographical problems, the existing wells have been drilled in many different positions within their target areas, resulting in skewed drainage areas. Five new wells are required to complete the six patterns that would be necessary to waterflood the pool. The recovery losses that would occur if the five wells were drilled on corner rather than central targets was estimated by Dome to be 250 000 barrels (bbl) [40 000 cubic metres (m^3)] of oil, or roughly 50 000 bbl (8 000 m^3) per well.

Dome stated that the development of heavy-gravity oil pools would occur on spacing of less than 40 ac (16 ha) and would require uniformly spaced wells in order to drain the highly-viscous heavy oil from the reservoirs. The use of tertiary recovery schemes utilizing thermal methods would necessitate well-spacing requirements in the order of 10 ac (4 ha) ie, 16 uniformly-spaced wells per quarter section. Under such intensive drilling it would be impractical to avoid the middle of fields. From an engineering and economics view, if directional drilling were justified in the heavy oil area, Dome submitted that it would require some 16 drilling pads on a section of land which would place some of the pads out on the fields. A well directionally drilled to a centre or a corner target area would not change this situation. Further, because of the typical shallow vertical depth of production in the heavy oil areas, directional drilling from the fence lines to the centre of fields will not be possible due to the relatively long horizontal distances involved.

Dome stated the existing regulations, which provide maximum flexibility for locating wells, are optimum for surface and subsurface considerations. Dome maintained that the entire target area, rather than a primary and secondary target area as at Grande Prairie, should be available to the industry to enable the most desirable technical location to be selected and drilled without the delays associated with lengthy negotiations or the hearing process. Dome pointed out that time deadlines are often critical owing to competition within the petroleum industry and expressed concern that any changes that would restrict ready access to the entire target area might cause an operator to accept a technically less desirable location as a matter of expediency. Instances where timing of drilling could be critical including actions preparatory to crown land sales and meeting drilling obligations for expiring leases.

Dome's experience in the green zone, and in particular the eastern slope area of Alberta, was that the existing central target areas, including the common overlap of oil and gas targets offered the best flexibility to satisfy, not only the petroleum industry, but also, the concerns of the forestry and coal industries and the provincial departments and agencies having jurisdiction with respect to forestry, environment, and fish and wildlife management.

Dome submitted that interference with farmsteads is minimal with centrally-located wells and that as wells are moved towards the peripheral areas of a DSU the probability of conflict between farmsteads and the target areas rises. It suggested that the increased acreage requirements under centrally-located wells compared to corner wells is small due to the common practice which permits farming of over half of the lease acreage around wellheads and access roads. Also, Dome contended that with corner target areas and associated fence-line roads, essentially all of the lease is unfarmable. The problem of weed control thus becomes a greater problem for both landowner and operator since the roadway and well sites cannot be readily cultivated. Dome noted that inconvenience and loss is also a matter of compensation to the landowner.

PanCanadian submitted that the existing central normal target area pattern minimizes equity problems in areas where mineral and surface ownership is not in large contiguous land parcels. PanCanadian acknowedged that it would be helpful to the agricultural industry to know for planning purposes that wells would be in the corners of fields. PanCanadian suggested, however, that there would be little gain by the agricultural industry in terms of land conservation and that the main concern appeared to be to minimize inconvenience to farming operations. It stated that in balancing the advantages and disadvantages of a change, if it became evident that a change would adversely affect recovery of petroleum resources, then a change should not be made. PanCanadian noted that loss of recovery of a petroleum resource is not compensable whereas surface-land impact is a compensable item. It submitted evidence suggesting that an anticipated 600 000 bbl (95 000 m^3) reduction of recovery could be expected in the Wembley Halfway B oil pool (Wembley pool) as a result of the 1980 target-area shift from central to northeast locations. It modelled the pool to determine the effect on recovery for a 30-year period for waterflood and miscible-flood depletion schemes in which there was an equal number of producing and injection wells. Maximum recovery was predicted, utilizing a waterflood depletion scheme with normal well spacing and central target areas, compared to depletion under waterflood with one-quarter of the wells on central targets and three-quarters of the wells on corner target areas. PanCanadian submitted the loss was significant, and additionally, it had the most serious effect on PanCanadian's acreage where it would be in the order of 400 000 bbl (64 000 m^3).

PanCanadian submitted that an equity problem does not exist in the southern portions of Alberta covered by SU 800 due to its larger blocks of common ownership where the geology of gas formations is consistent across large areas, thus minimizing lease boundary effects. Also, the oil deposits are relatively small and are usually classified as heavy oil. Hence, development is on 40-acre spacing and since individual pools were usually drilled out prior to 1974, the mixing of target areas was avoided.

PanCanadian stated that the equity question in the Grande Prairie area is minimized by the rather large mineral lease holdings averaging seven to eight sections, but problems will exist along lease lines and in the Wembley pool where there may also be a conservation problem due to non-uniform targets. It also examined farming communities throughout central Alberta north of township 31, including Red Deer, Stettler, and Edmonton, where virtually all of the freehold royalty lands exist and where individual leasing has resulted in widely diversified working-interest ownership. PanCanadian found 85 per cent of the mineral leases to be smaller than one section. PanCanadian expressed the view that due to the large freehold situation in this area mixed in with crown mineral holdings, the equity problem might be compounded if central target areas were not maintained.

The Canadian Petroleum Association, Independant Petroleum Association of Canada, and companies including Amoco, Chevron, Hudson's Bay, Shell, and Western Mines supported the positions of Dome and PanCanadian that the existing system of central target areas offers the agricultural and petroleum industries the widest flexibility and should be maintained.

Chevron stated in closing argument, that the benefits to be gained by the agricultural industry in shifting to corner targets are not sufficient to justify such a change. It believed that many of the complaints of inconvenience, higher farming costs, and good acreage being unnecessarily taken out of production are holdovers from the past and do not correctly reflect current leasing conditions, remuneration, lease operation, and reclamation practices.

Esso supported a change to corner target areas provided any new provisions are sufficiently flexible to deal with the concerns of the petroleum industry respecting equity, geological interpretations, predictable hole deviation, topographic conditions, and clustering of wells adjacent to already developed oil and gas pools or previously drilled wells. It was not thoroughly convinced that adopting corner targets would solve all the problems expressed by the agricultural industry, particularly in areas where close well spacing is required. The continuing necessity to drill wells will inevitably interfere with the surface of the land. However, Esso noted the farming community appears to be convinced that corner target areas will result in significant improvement.

Esso submitted that the suggestion that well sites be located along the perimeters of sections and that directional drilling be used, is not practical. There are, Esso concluded, only a limited number of situations where directional drilling is both technically and economically feasible.

All of the petroleum industry participants objected to the proposal by Unifarm and other agricultural industry groups that the target area for the one-section gas DSU be moved to the northeast of the section. They submitted that it is necessary to locate gas wells near the centre of the section in order to adequately prove up and drain underlying reserves. Severe equity problems would result if the target areas were shifted to the northeast corner. Also, a target-area shift for the standard gas DSU to the northeast corner would work a serious disadvantage to a mineral owner having rights to any portion of a section other than the northeast quarter. The absence of a prescribed target and the ensuing off-target penalty rules would adversely affect his opportunity to produce gas relative to that of the owner of the northeast quarter.

4.4 Board Views

4.4.1 Impact on Agriculture

The Board understands that the major concern of the agricultural industry is that of the effects of land severance and extra headlands on farming and ranching operations that are caused primarily by well-access roads. Additional important concerns respecting impact on agriculture include: actual amount of land consumed by well sites and access roads; well site target locations in relation to farm sites; and well site setback requirements in relation to municipal roads, power lines, pipelines, etc.

It is generally agreed that irrespective of its location, the area required for a well site will be more or less a constant. From a comparison of a two square mile area, subject to quarter-section spacing as illustrated in Figure 9, the Board concludes that the northeast corner target orientation would result in a combined reduction in lease roadway requirements of approximately two ac for the eight wells. Also, a nominal reduction in the acreage required for well sites might be realized if the wells were placed immediately adjacent to municipal road allowances. However, as illustrated on Figure 10, existing setback requirements prescribed by the Oil and Gas Conservation Regulations normally place a well 100 m from the road allowance, and this setback may be further increased if a dwelling or other surface improvement exists near the proposed well site. The Board's overall view is that the corner target orientation would permit only modest savings in acreage consumed by well sites and roadways.

The Board agrees with the agricultural industry that the result of the extra headlands, overlapping of farming operations, increased turning to circumvent obstacles and other inconveniences and nuisances resulting from wells being located in cultivated fields, reduces production and increases operating costs. These inefficiencies are particularly the result of the access roads. The Board recognizes that these effects, like acreage losses, could be compensated for by the lease agreement, but they nevertheless would continue to be a regularly visible source of concern to the landowner. The Board thus believes that while the direct benefits in terms of reduced impacts by moving well sites out of the centre of quarter sections might not always be very large, the indirect ones especially relating to well access roads are significant over the long term.

The Board agrees with the Cattle Commission that the impact on cattle operations of corner well locations would be less than that of well sites located in the midst of grazing and haying areas. The Board considers that corner locations would further minimize the opportunity for livestock harassment and trespass on grazing and other farmlands. In most instances, fencing of well sites would assist in minimizing trespass. However, the Board has observed that it is frequently of mutual benefit to the landowner and the petroleum industry to leave access roads and leases unfenced for reasons of weed control and maintenance.

The Board notes from the evidence presented during the hearing that it may be slightly more common to find farm dwellings located within or near corner target areas than central target areas. Also, the Board notes that several agricultural industry representatives contended that they would rather have the nuisance for two or three weeks of a well being drilled near the farmyard, than the nuisance of a wellhead in the middle of the field for many years. On these considerations, the Board concludes that there would be little difference in impacts for either corner or central target areas.

The Board recognizes the point expressed by the petroleum representatives that the existing 100-m setbacks from municipal road allowances now set out in the Oil and Gas Conservation Regulations would, irrespective of other changes in target provisions, force many well sites to be located inside rather than at the very edges of agricultural land parcels. The Board now believes that this amount of setback should be reviewed as it is evident that it causes undesirable intrusion on land use and also may be unnecessarily large for today's land-use environment. The Board notes that it was indicated during the Grande Prairie proceeding, that perhaps a revised normal setback of 30 m would suffice for most purposes except for human dwellings.

In summary, respecting impact on agriculture for standard quarter-section spacing, the Board sees reduced impact from corner target areas due to modestly less land being used, less land severence, reduced access road problems, lessened impact on farming operations, and a reduction in general nuisance.

The Board notes that for gas wells on one-section spacing, the current central target area provides considerable opportunity to locate wells and access roads along quarter-section boundary lines. Thus, the advantages to the agricultural industry of shifting the gas target from the centre of the section to the northeast corner appear to be much less significant than the advantages of shifting oil targets away from the centre of quarter sections. Nevertheless, it should be noted that if gas wells are drilled on quarter-section spacing, their target areas would be identical to those for quarter-section oil spacing.

The Board recognizes the advantages to the agricultural industry of directionally drilling a well from a surface location on the periphery of a quarter section or outside the parcel of land. The main advantage of such a well would be a shorter access road and thus some reduction in the interference with surface operations. On the other hand, the Board agrees with the petroleum industry that the risk of directionally drilling exploration or evaluation wells may not be warranted because of technical limitations or economics. Consequently, the Board believes it proper to only consider the merits of directional drilling on a site- or project-specific basis.

4.4.2 Impact on Recovery of Oil and Gas

The Board believes that where there is not a conflicting spacing change within a pool, the amount of resources encountered by wells and the efficiency of drainage or recovery would, on balance, be equal whether a pool was drilled on corner or central target areas. The Board notes that the provision of central targets for quarter-section DSUs, standard for oil, may cause irregular patterns to occur for subsequent development on closer well density whereas the smaller primary target area associated with a shifted target would reduce this tendency. Considering that the prospects for future reduction in oil DSUs are significant, the Board suspects that corner target areas for oil may be relatively advantageous for future oil recovery.

The Board considers reasonable the estimates by PanCanadian and Dome that ultimate recovery of reserves could be reduced by some 600 000 bbl (95 000 m^3) in the Wembley pool and by some 250 000 bbl (40 000 m^3) in the Bonanza pool if central targets were converted to corner targets during the development of the pools and also assuming no future reduction in well spacing, no drilling of infill wells, and rigid use of primary targets.

The Board considers the Bonanza pool to be a reasonably delineated pool with 9 of a possible 31 locations yet to be drilled. If target areas were shifted, and again assuming no future infill drilling, the Board believes the principal recovery loss in the Bonanza pool would occur from the unswept areas along the southwest flank which are not offset by increased sweep along the northeast flank. To minimize such losses, future wells might have to be drilled on the outer edges of a secondary shifted northeast target area, while others might be located in a more central position.

The Board recognizes that including the Wembley pool in the shift to the northeast target area when only 20 of a possible 80 wells had been drilled could result in some inefficient flood-pattern development. However, the Board concluded in its Decision Report 80-8 for the Grande Prairie area, that where necessary to accommodate special problems, locations outside the primary target area should be utilized. It further stated that, since part of the northeast target area is within the subsisting target area, a well under the revised target-area provisions could be drilled on a pattern that is largely compatible with that already established. The Board was of the opinion that by applying the target-area change to the Wembley oil pool, many of the remaining wells could be located in a manner that would reduce the impact on farming operations without having a serious impact on either oil conservation or equity. The Board believes that conservation losses could be significantly lower than estimated by PanCanadian if secondary target areas were used. The Board, however, is prepared to consider target areas away from the northeast corner in Wembley on the basis of the merits of each particular case, including a recognition of impact on oil recovery, future need for infill wells, and effects on surface operations.

4.4.3 Impact on Equity

The Board considers a serious equity problem could exist where changes in target areas occur within a pool and in an area of mixed ownership. The majority of oil pools in the province were drilled out long ago and would not be affected by a shift in target area. Applying corner targets to newly discovered oil or gas pools would allow the same degree of uniformity in spacing as now exists. However, there remains an equity problem to some extent because minerals are leased on a legal survey basis and corner or fence-line target areas would mean capture of part of the leased minerals and part of those in some other lease. This is more of a problem where lands have been purchased in the past but is random in the sense that any one operator might benefit in some areas and suffer a loss in others. The affect of non-central targets has been long present for areas such as Pembina and Swan Hills developed on the southwest target locations for oil and, furthermore, has influenced the administration of PSUs that incorporate undrilled DSUs. Overall, the Board does not view the equity problems that would result from a change in target areas for oil DSUs as serious except in portions of pools with both mixed target areas and mixed ownership. The Board also notes that for gas wells, because gas flows more freely in a reservoir than does oil, and because normal DSUs are so much larger (one section), the equity problems with non-central targets are greater than for oil. Gas pools are sometimes developed on half-section or quarter-section spacing to permit drainage of low quality reservoirs. In these circumstances, because the well-drainage radius is relatively small, a shift in the target area for the gas DSUs should not cause serious equity problems.

4.4.4 Impact on Flexibility in Exploration

The Board considers that any change to target areas which would reduce the common area of the oil and gas target would reduce flexibility for exploration. This is a function of the extent of the area of overlapping gas and oil target areas and not a function of whether the common target area is in the corner or centre of the section, since oil and gas occurrences are random with respect to the survey system. In considering a possible shift of target areas, the Board investigated several alternatives which would increase flexibility in exploration. One alternative considered was an increased target area size. The Board also considered Mr. O'Ferrall's suggestion for complete flexibility by not prescribing any set target area.

The Board has concluded that a shift of target areas to the corner for oil wells but not for gas wells would cause reduced flexibility in locating exploration wells. However, the Board does not believe this disadvantage is so great as to cause it to either not shift the oil target area or, alternatively, to shift the gas target area along with the oil target area. Notwithstanding that general conclusion, the Board appreciates that there would be advantages in providing a more flexible attitude toward well-target provisions where land-use problems have been fully resolved and it is not possible to reasonably predict the likelihood of oil or gas being found. The Board intends to pursue this problem in the next few months with a view to issuing a guideline informational letter thereon.

4.4.5 Summary of Board Views

After weighing the evidence, the Board concludes that:

(a) the positive impact to the agricultural industry of moving target areas for oil wells closer to fence lines and the compatibility of corner targets, if accompanied by a primary target area, to future reduced well patterns generally outweighs the negative impact of such a move on equity and flexibility for exploration, except in some instances where significant mixed target areas and mixed ownership occurs. Therefore, a shift in oil target areas for quarter section and smaller DSUs to allow more fence-line wells is warranted,

(b) for gas wells, the advantages to the agricultural industry of shifting targets from the centre to the corner of a section of land appear rather limited while the impact on the subsurface mineral owner in terms of both equity and efficient drainage are significant. Thus, a shift in target areas for gas wells should not be made,

(c) corner target areas would change the configuration and location of the common target areas for oil and gas, resulting in some reduced flexibility in selecting well sites especially in the northeast quarter section. This reduced flexibility could result in some restrictions in exploration and solutions to this problem will be pursued further during the next few months,

(d) the decision to directionally drill a well or group of wells, since it often involves unusual cost considerations, should be evaluated on a site by site basis having regard for specific technical, economic, resource recovery, and land-surface considerations, and

(e) the current 100-m setback provision restricts opportunities to drill near quarter-section boundaries and should be reviewed by the Agriculture-Petroleum-Government Committee[1] to determine the feasibility of a considerable reduction.

5 DESIRABLE CHANGES TO SUBSISTING TARGET AREA PROVISIONS

5.1 Agricultural Industry

Unifarm preferred that target areas for oil and gas wells be restricted to the extreme northeast Lsd of the DSUs with a designated primary and secondary target area. Unifarm proposed that the primary target area should be the northeast quadrant of the Lsd and the secondary target area would be the balance of the Lsd. Unifarm maintained that shifting both oil and gas target areas would enlarge the common target area and substantially increase the flexibility in locating a well on target. Unifarm recognized that under certain circumstances the northeast corner target area would not be satisfactory and suggested such instances be dealt with individually by application to the Board.

Unifarm suggested that, in instances where conservation issues, correlative rights, and other problems were significant, unitization, pre-drilling agreements or other contractual arrangements were available to the petroleum industry to resolve such problems.

Unifarm submitted that any new target-area orientation should be extended to the balance of the white and yellow areas of Alberta (as designated by Alberta Energy and Natural Resources, Public Lands General Classification).

The Cattle Commission expressed support for the concept of corner target areas with a primary and secondary target area for oil and for gas wells. The Cattle Commission proposed that wells should be located as close as possible to the northeast corner of sections and quarter sections and to road allowances. It acknowledged that geological data, surface configurations, and smaller DSUs might be legitimate reasons for limiting the potential location for a well site but requested that the landowner's concerns be viewed as important reasons for selecting a well site.

---

[1] A twelve-member committee recently established to address a number of problems of mutual concern including land reclamation and minimizing land-use impacts. Terms of reference and members of the committee are included in Appendix III to this report.

The Christian Farmers stated that equity considerations should not be a sufficient reason to maintain target areas in the centre of fields, and therefore, it favoured shifting both oil and gas target areas to the northeast quadrants of a section. The Christian Farmers favoured a primary common oil and gas target area in the north and east half of Lsd 16, and thought the second best common oil and gas target area would be the north half of Lsd 8.

The Elk Point Association contended that the surface location of well sites should be on the perimeter of fields and quarter sections with the well directionally drilled to the target areas. The Elk Point Association also endorsed corner target areas as an improvement over the present central target areas.

Generally, the other farm groups endorsed the concept that the target areas for quarter-section DSUs should be located in the extreme northeast corner of the DSU or along property boundaries. In many cases the farm groups favoured a corresponding shift of the one-section DSU target area to the northeast portion of the section. They generally requested a primary target area in the northeast quadrant of Lsd 16 to ensure corner well sites as often as possible. They generally agreed that it would be inappropriate to change the target position for lands already drilled, as any such shift would incur additional land segmenting if further drilling were to occur.

Mr. O'Ferrall submitted that the size of the DSU or optimum well density should be established in accordance with the characterisitics of the reservoir rock and fluids, and conservation issues. He submitted that target areas should not be established in advance and that the location of any particular well to be drilled should be determined only after considering the use of the surface, the impact of a well on that use, correlative rights of mineral owners, conservation and such further geological considerations as may influence the optimum well location. Mr. O'Ferrall recognized that as an area is drilled, the flexibility with respect to well location would be reduced, but maintained that there should not be a pre-established target area within any spacing unit.

5.2 Alberta Government Departments

Alberta Agriculture submitted that the pattern established by Decision 80-8, Drilling Spacing Unit Target Area Requirements for Oil and Gas Wells in the Grande Prairie Area, should be adopted throughout the province, including the irrigation areas, for all new oil wells on arable and potentially arable lands. Alberta Agriculture recommended that the 250-ac (112-ha) gas target area be shifted to the northeast corner of the section with the primary target area being the northeast quadrant of Lsd 16.

Alberta Energy and Natural Resources suggested in its letter that the present target area overlap of one-section and quarter-section DSUs be retained. However, it recommended shifting the pattern within the section so as to alleviate surface conflicts. It suggested there be a degree of flexibility to consider inherent variations and to meet the needs of both surface and subsurface owners.

5.3 Petroleum Industry

Dome Petroleum submitted that further revisions to standard target areas for oil and gas on a province-wide basis are neither warranted nor desirable. Dome stated that, if the Board agreed with the proposals of the agricultural industry, any such revisions to standard target areas should be restricted to agricultural areas only and not apply to the "Green Zone", and that exceptions should be made for developed pools and for the heavy oil district.

Dome proposed a heavy oil district extending from townships 31 to 65, ranges 1 to 10 west of the 4th meridian, inclusive. Dome submitted that the maximum potential recovery of heavy oil would only be realized on 40-ac (16-ha) spacing with four uniformly spaced wells per quarter section draining the heavy oil reserves from the reservoir. Extensive use of tertiary recovery schemes utilizing thermal methods will be required to further maximize oil recovery for many of the shallow heavy oil pools and this will necessitate well spacing of 16 uniformly spaced wells per quarter section. Such spacing would, Dome submitted, render corner target areas impractical.

Dome submitted that, if a change in target areas were necessary or desirable, such change should be made on the basis of the target areas prescribed in SU 800 for southeastern Alberta where primary and secondary target area designations do not exist. Dome stated the designation of a primary target area, as in SU 1040 for the Grande Prairie area, is undesirable because it restricts the flexiblity needed to accommodate the landowner and the proponent of the well.

PanCanadian submitted that it preferred retention of central target areas, but recognized the potential need for special target provisions in unique circumstances. If a change to the target area were considered necessary, PanCanadian proposed that consideration should be given to the potential for future 80-ac or 40-ac (32-ha or 16-ha) spacing. It further suggested that primary target areas might be established in the extreme corner of each quarter-section DSU, with central interwell distances prescribed rather than specific target areas. Once the first well had been drilled, future locations could be selected towards the centre of the section or near the corners.

The balance of the petroleum industry representatives, except Esso, did not agree with the concept of the shift of the target area for oil and gas wells to the northeast corner of quarter sections, nor did they agree with the proposed restrictions regarding primary and secondary target areas. The petroleum industry contended that maximum flexiblity was essential for exploration.

Esso recommended that the corner target-area provision of SU 1040 in the Grande Prairie area be extended to other areas of the province except for the Green Zone, the areas adjacent to already developed oil and gas fields and previously drilled wells, and to the area of southeastern Alberta covered by SU 800. Esso also requested that any revisions be sufficiently flexible to deal with site-specific concerns respecting conservation, geological and topographical situations, and equity.

The petroleum industry representatives generally submitted that a change in target area pattern should not be made in the Green Zone and in particular in the eastern slope area, even if changes are made elsewhere. The existing target-area configuration with its overlapping common areas provides, in these areas, necessary flexibility to satisfy the concerns of the forestry and coal industries, and the provincial departments and agencies having jurisdiction with respect to forest, environment, and fish and wildlife.

5.4 Board Views

The Board considers the proposals of the agricultural industry to adopt corner target areas for oil wells to have significant merit in many situations and in many areas of the province. However, the Board believes that restricting target areas to the extreme corner of a DSU as proposed by Alberta Agriculture or along property lines as suggested by the Elk Point Association is too restrictive and could result in serious oil and gas conservation and equity problems.

The Board considers that the central target for one-section gas spacing satisfies many of the concerns of the agricultural industry since it permits drilling of a well near quarter-section boundary lines or near the centre of a section where access roads could follow quarter-section boundaries. Consequently, the Board is not prepared to shift the one-section gas target area.

To encourage a well to be located as close as possible to the corner or the boundary of the quarter section, the Board believes that the target area can be divided into primary and secondary areas as was done at Grande Prairie and as illustrated in Figure 7. The primary target area for quarter-section spacing would be the northeast quarter of the northeast Lsd. The secondary target area would be the remainder of the northeast Lsd. The target area for a one-section DSU would have a primary target area in the northeast quarter of Lsd 6. The secondary target area would be the remainder of the one-section target area.

Locating a well in the primary area is preferred and would be automatic with the agreement of the surface landowner. Since the primary area is the target area subscribed to by the majority of the agricultural groups, the Board would expect such agreement would be readily available. For the secondary target area, proposed wells would also be approved if agreed to by the surface landowner. Where such agreement did not exist, the Board would consider the application in the light of the landowner's objections to the location and the applicant's geological or other evidence supporting the request. In such instances, a simplified hearing procedure could be used that would only require the presence of the Board representative, the proponent of the well, and the landowner, with a decision being made immediately. This procedure, when judged appropriate, will be used from the date of this decision.

For spacing of less than one-quarter section, the Board considers it desirable to adopt a northwest orientation of target areas in the effort to maximize fence-line opportunities for wells. This is consistent with what exists in the Grande Prairie area and is illustrated in Figure 8.

In summary, the Board finds that for the white and yellow areas of Alberta the well spacing provisions for quarter-section DSUs should be amended to provide for northeast target-area orientations and classification of the target areas into primary and secondary areas as shown on Figure 7. For smaller spacing, the target area would be as shown on Figure 8. The Board further concludes that the one-section DSU target area for gas wells should remain on a central pattern with the primary target in Lsd 6 as shown on Figure 7.

The Board considers mixing target-area patterns in pools that have been fully delineated and substantially developed to be generally inappropriate except in specific cases where it can be established that there would be minimal impact on conservation and equity and it would significantly reduce land-surface impact. For this reason, the Board will exclude from any target-area change, lands within Board-designated oil pools as of a spefic date. The reason for not excluding currently existing gas pools is that no change is being made to gas target areas.

The Board recognizes that there may be lands outside declared pools where the industry believes a retention of central targets is appropriate. The Board would expect these to be brought before it in specific applications with supporting evidence. Similarly, there may be areas within designated oil pools where landowners believe corner target areas are justified. In either case, requested changes would be considered by the Board only after giving directly affected persons an opportunity to speak to the matter.

The Board considers it in the public interest to retain an appropriate requirement for setback from the target-area boundary to accommmodate normal wellbore deviations and from surface improvements to ensure public safety. The Board recognizes, however, that the current 100-m setback may be an overly conservative restriction and that it might be reduced to perhaps 30 m as was suggested at the Grande Prairie hearing. The Board plans to refer this question to the Agriculture-Petroleum-Government Committee. In the meantime, the Board is prepared in certain situations to consider relaxing its 100-m setback requirement upon written request and consent of the proponent of the well, the landowner and any other member of the public whose rights might be affected.

6 IMPLEMENTATION OF THE REVISED TARGET AREAS

6.1 Agricultural Industry

When implementation of any revisions was addressed by the farm groups, they encouraged speedy implementation to minimize the impact of future drilling on agricultural operations.

6.2 Petroleum Industry

The petroleum industry suggested that if target-area changes were to be considered, the implementation should be delayed until the full impact of the Grande Prairie changes were known and understood.

6.3 Board Views

The Board sees no valid reason to delay target area changes and believes that the changes described in section 5.4 should be implemented immediately.

7 DECISION

After considering all of the evidence, the Board has decided:

(a) that the target areas for DSUs of less than one section should be changed to provide for target-area orientations and primary and secondary target areas as described in Figures 7 and 8,

(b) that the target area for one-section spacing should remain in the centre of the section and should have a primary target area as shown in Figure 7,

(c) that the changes will be effective for all white and yellow areas of Alberta, as shown on Figure 1, exclusive of lands within existing Board-designated oil pool boundaries as of 1 August 1981, and exclusive of the area covered by SU Order 800 and other spacing orders, and

(d) that the changes will be effective 1 September 1981 as prescribed in the amending spacing unit order, SU 1088, which will be issued in the next few days.

To facilitate item (c) above, the new spacing unit order will list those pools which the Board considers to be "oil pools".

DATED at Calgary, Alberta,on this 4th day of August, 1981.

ENERGY RESOURCES CONSERVATION BOARD

G J DeSorcy

G. J. DeSorcy, P.Eng.

C. J. Goodman

C. J. Goodman, P.Eng.

N. Strom, P.Eng.

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Alberta Cattle Commission (Cattle Commission) K. Schneider	K. Schneider W. Heller R. Feniak
Alberta Surface Rights Federation (Surface Rights Federation) P. Vasseur	P. Vasseur G. Moulton B. Haddrell
Blindman Valley Farmers Association (Blindman Valley Association) B. Tona	B. Tona
Bluffton Agriculture Association (Bluffton Association) L. Luft	L. Luft A. Goetz
Bonanza and District Surface Rights Association (Bonanza Group) B. Ellingson	B. Ellingson W. Meier
Christian Farmers Federation (Christian Farmers) J. Kolkman	J. Kolkman
County of Beaver No. 9 V. Istace	V. Istace H. Entrup
County of Leduc No. 25, Agricultural Development Committee (County of Leduc No. 25) E. Zotzman	E. Zotzman
Department of Agriculture B. Colgan	
Elk Point Surface Rights Association (Elk Point Association) L. Miller	L. Miller R. Danyluk A. Bugeja G. W. Belke

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report	Witnesses
Farmers' Advocate of Alberta (Farmers' Advocate) H. Entrup	H. Entrup B. Haddrell R. Feniak
Improvement District No. 19, Surface Rights Group (I.D. No. 19) O. Pawluski	O. Pawluski D. Berner E. Socha
Mountainview Landholders Group (Mountainview Group) J. Paton	J. Paton
Municipal District of Bonnyville No. 87 and Improvement District No. 18, Agricultural Development Committee (M.D. of Bonnyville No. 87 and I.D. No. 18) J. Dargis	J. Dargis J. Sarwenski
Municipal District of Sturgeon (M.D. of Sturgeon) G. W. Belke	G. W. Belke
O'Ferrall, B. K.	B. K. O'Ferrall
Parkland Acreage Owners Association L. Proudfoot	L. Proudfoot
Smoky River Surface Rights Society (Smoky River Group) J. D. Carter	A. Briand H. Dion L. Duby D. Champion D. Cote J. Zahara S. Arnadt A. Cloutier G. Gour R. Girard R. Lobercque R. LaPointe C. Penson J. Liland, P.Eng.

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Three Hills Surface Rights Group P. Vasseur	P. Vasseur
Unifarm S. Fisher	I. Weleschuk R. Wilson S. Bell W. McNary, P.Ag.
Warburg-Pembina Surface Rights Group G. Begg	G. Begg
Willow Creek Agricultural Development Committee and Willow Creek Surface Rights Society (Willow Creek Group) E. Nelson	E. Nelson
Amoco Canada Petroleum Company Ltd. (Amoco) J.G.F. McLeod, P.Eng.	J.G.F. McLeod, P.Eng.
Canadian Petroleum Association A. G. Kruse	R. W. Hoover, P.Eng. D. J. Hemphill, P.Eng.
Chevron Standard Limited R. A. Pashelka	
Dome Petroleum Limited (Dome) A. L. McLarty	H. J. Strain, P.Eng. B. Alberts, P.Eng. D. J. Rae T. P. McGlynn J. A. Lore, P.Eng. of McKinnon Allan and Associates
Esso Resources Canada Limited (Esso) R.P.J. Gaetz	H. S. Simpson, P.Eng.

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Hudson's Bay Oil and Gas Company Limited (Hudson's Bay) A. G. Kruse	
Independent Petroleum Association of Canada L. Grimson	
PanCanadian Petroleum Limited (PanCanadian) W. J. Hope-Ross	B. A. Stevens, P.Eng.
Shell Canada Resources Limited (Shell) D. J. Hemphill, P.Eng.	D. J. Hemphill, P.Eng.
Western Mines Limited (Western Mines) J. R. Newbert, P.Eng.	
Energy Resources Conservation Board staff M. J. Bruni	D. G. Pearson, P.Eng. Wm. H. Wolff, P. Eng.

APPENDIX II THOSE WHO MADE A WRITTEN SUBMISSION TO THE BOARD BUT DID NOT APPEAR OR WERE NOT REPRESENTED AT THE HEARING

Alberta Energy and Natural Resources

Alberta Power Limited

Calgary Power Limited

County of Barrhead No. 11 (Agricultural Development Committee)

County of Barrhead No. 11 (Agricultural Service Board)

County of Camrose No. 22

County of Flagstaff No. 29

County of Paintearth No. 18

County of Wetaskiwin No. 10 (Agricultural Development Committee)

Crawford, Graham D. - Smoky Lake, Alberta

East Central Landholders Protective Association

Fairview Surface Rights Group (Municipal District No. 136)

Fischer, Georg W. - Demmitt, Alberta

Lakeland Environmental Agricultural Protection Society

Lamont & District Farmland Protection Association

Red Raven Surface Rights Protective Association

Will Farms Limited - Standard, Alberta

APPENDIX III AGRICULTURE-PETROLEUM-GOVERNMENT COMMITTEE TERMS OF REFERENCE

As indicated in Decision Report 81-4[1], the Board believes that certain current oil field practices and Board regulations should be reviewed to determine whether or not they are appropriate under current conditions. In each case the Board requests the Committee to consider the current practice and related registration and regulations in comparison to the proposed practices, and to evaluate the costs and benefits of the alternatives.

The specific terms of reference are as follows:

1 Should the licensee of a well be required to obtain the agreement of the surface owner respecting the location of production equipment on the well site, and if so, how should it be accomplished?

2 Should the disposal of certain kinds of waste material into pits on the lease be prohibited? If so, what are the practical alternatives for disposal?

3 Should electrical lines to supply oil and gas production operations be buried?

4 Should drilling fluids be contained in tanks on the lease during drilling operations and disposed of off the lease when the drilling is completed?

5 Should the licensee be required to obtain agreement of the surface owner respecting the method of construction of the access road and its location within the right of way? Are innovative construction methods called for?

6 Should the method of vegetation control on the surface lease be modified and how much involvement should the landowner have in this process? Should there be increased inspection of active well sites and are reclamation procedures and certification processes adequate?

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[1] Dome Petroleum Limited, Licences to Drill Wells, Wembley Field, Decision 81-4, 13 March 1981.

APPENDIX III AGRICULTURAL-PETROLEUM-GOVERNMENT COMMITTEE MEMBERSHIP

Alan Frazer Barons	Unifarm
Charles Penson Grand Prairie	Bear Lake Surface Rights Group
Karl Schneider Mannville	Alberta Cattle Commission
Gordon Moulton Hussar	Alberta Surface Rights Federation

PETROLEUM INDUSTRY

Ron Findlay Amoco Canada Petroleum Company Limited	Canadian Petroleum Association
Ed McMaster Shell Canada Resources Limited	Canadian Petroleum Association
John Uibel PanCanadian Petroleum Limited	Independent Petroleum Association of Canada

GOVERNMENT

Brian Colgan Director, Land Use Activities	Alberta Agriculture
Doug Harrington Acting Assistant Deputy Minister Environmental Coordination Services	Alberta Environment
Keith Lyseng Manager, Resource Development & Reclamation	Alberta Energy & Natural Resources
L. A. Bellows, Manager, Development Department	ERCB
E. R. Brushett (Chairman) Manager, Environment Protection Department	ERCB
I. Weleschuck (Secretary) Agriculturalist, Environment Protection Department	ERCB

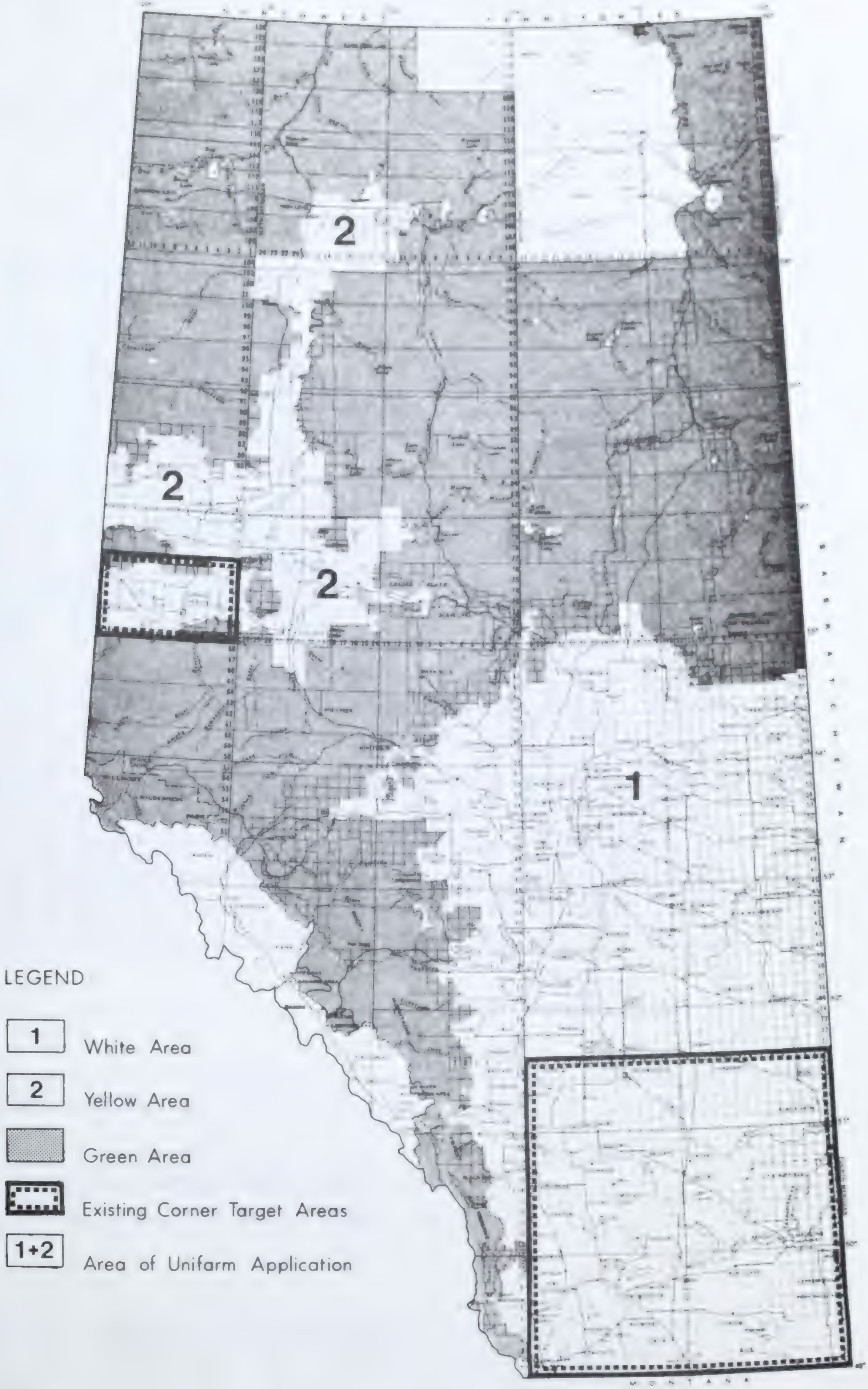
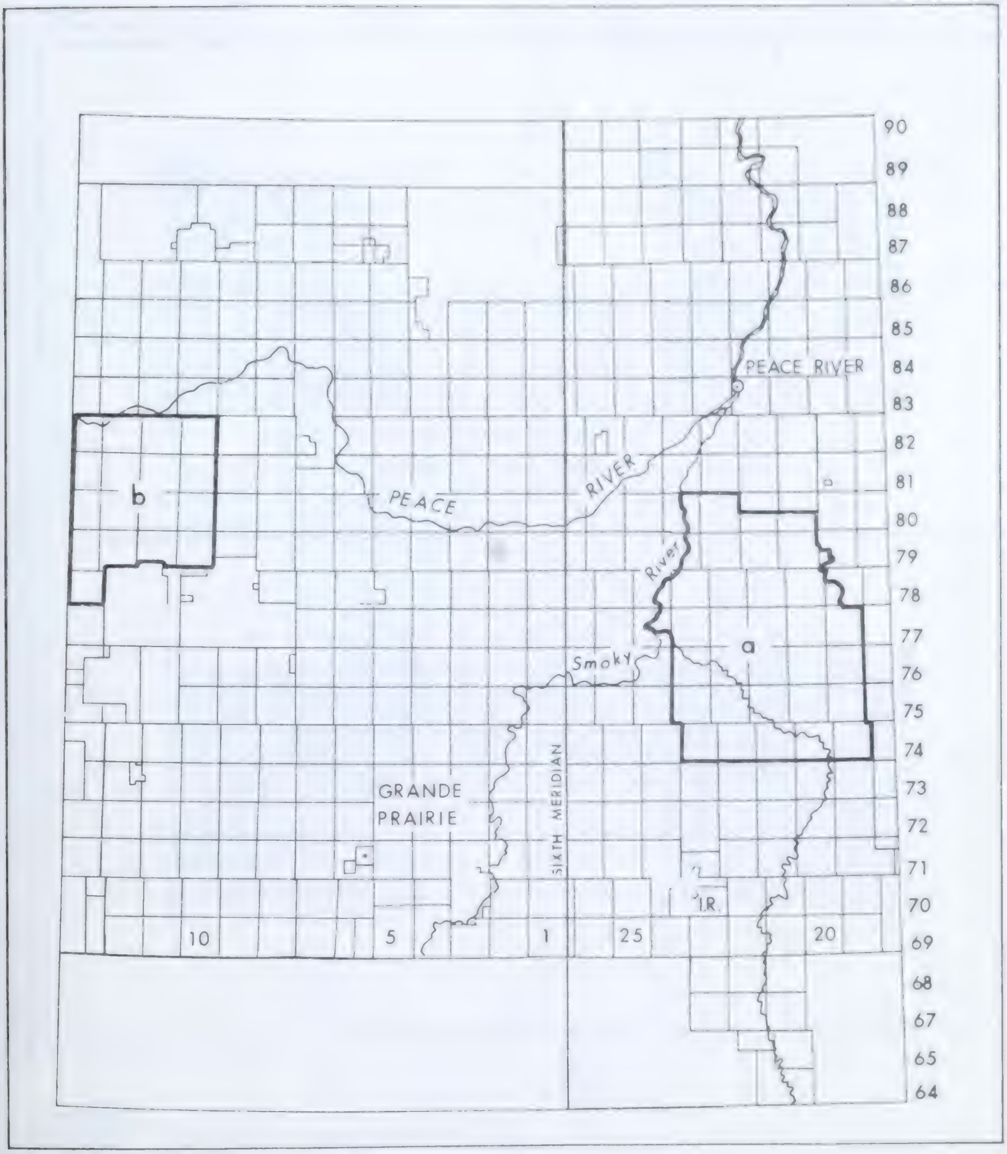


FIGURE 1 AREA OF UNIFARM APPLICATION AND OTHER SIGNIFICANT AREAS



a. Smoky River Surface Rights Society

b. Bonanza and District Surface Rights

FIGURE 2 AREAS OF APPLICATION

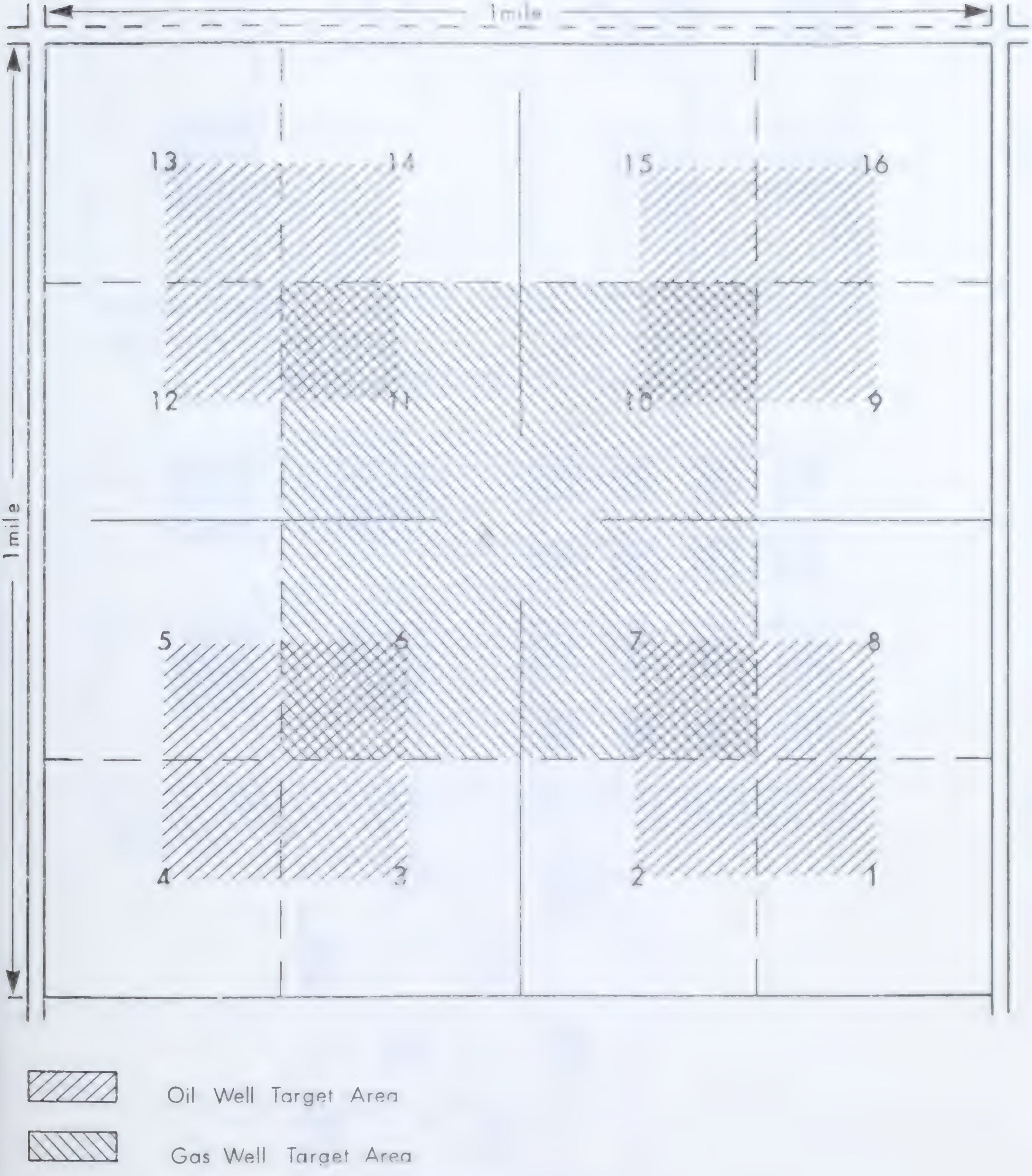
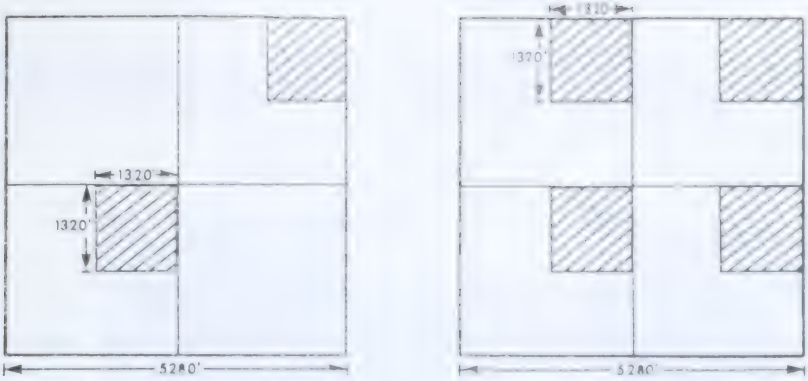


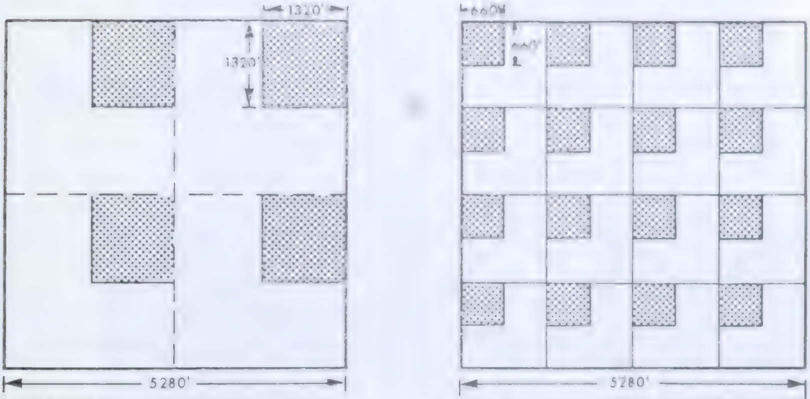
FIGURE 3 CENTRAL TARGET AREAS FOR ONE QUARTER SECTION OIL WELLS AND ONE SECTION GAS WELL - EFFECTIVE JANUARY 1968



A. FOR 1/2 SECTION DRILLING SPACING UNIT

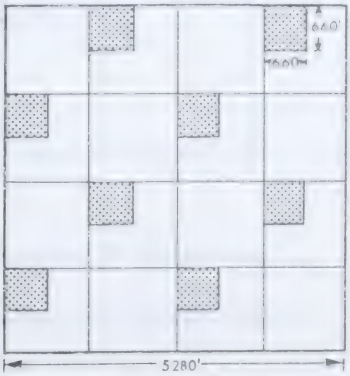
B. FOR 1/4 SECTION DRILLING SPACING UNIT

TARGET AREAS FOR GAS WELLS



A. FOR NORMAL 1/4 SECTION OIL DRILLING SPACING UNITS

B. FOR 1 LSD OIL DRILLING SPACING UNITS



C. FOR 2 LSD OIL DRILLING SPACING UNITS

TARGET AREAS FOR OIL WELLS

FIGURE 4 TARGET AREAS FOR OIL WELLS AND GAS WELLS OF LESS THAN ONE SECTION SPACING IN AREAS SOUTH OF TOWNSHIP 31 AND EAST OF THE 5th MERIDIAN

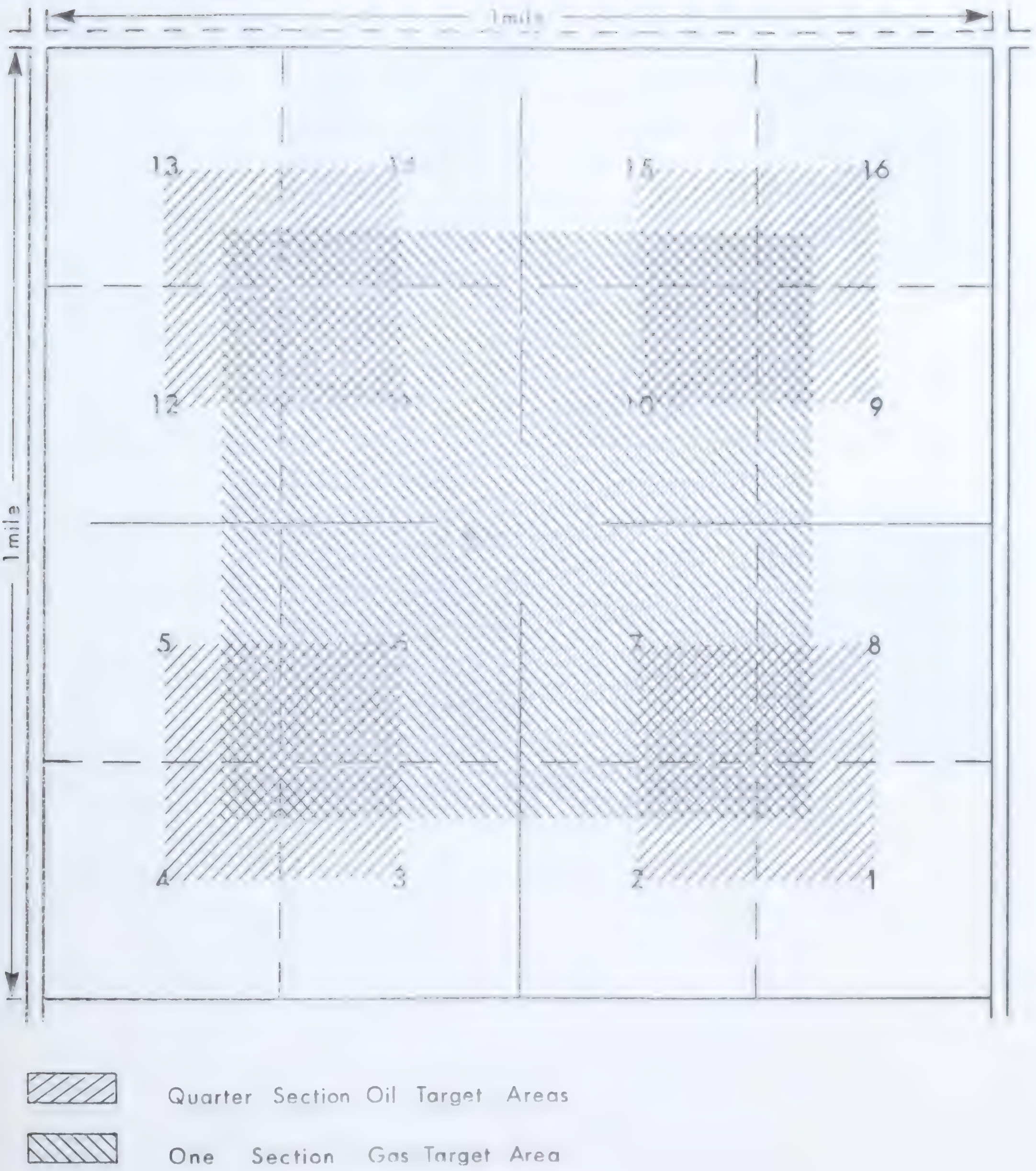


FIGURE 5 NORMAL DRILLING SPACING UNIT TARGET AREAS

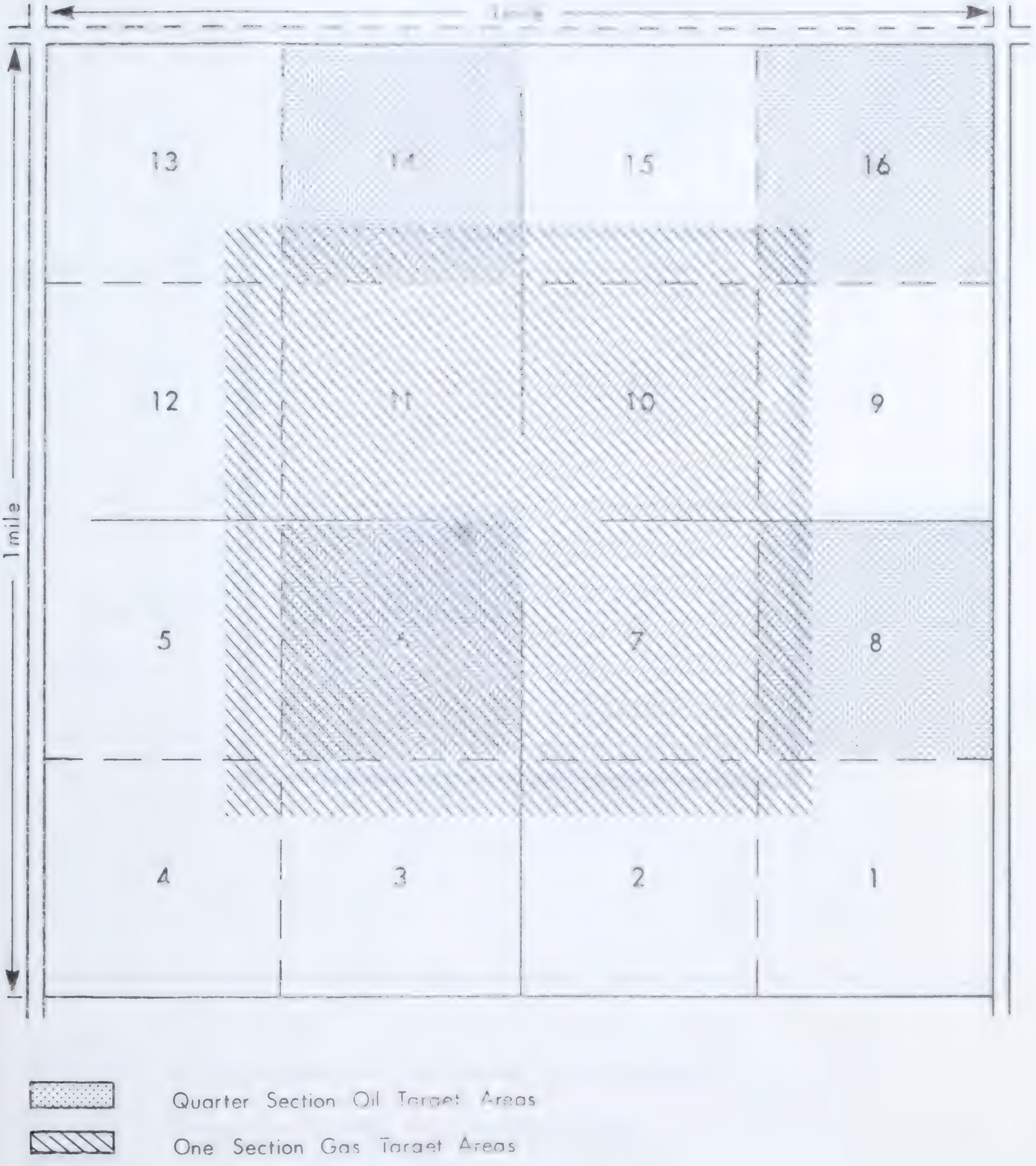

1 mile
1 mile
13
14
15
16
12
11
10
9
5
6
7
8
4
3
2
1
Quarter Section Oil Target Areas
One Section Gas Target Areas

FIGURE 6 DRILLING SPACING UNIT TARGET AREAS
SOUTHEASTERN ALBERTA

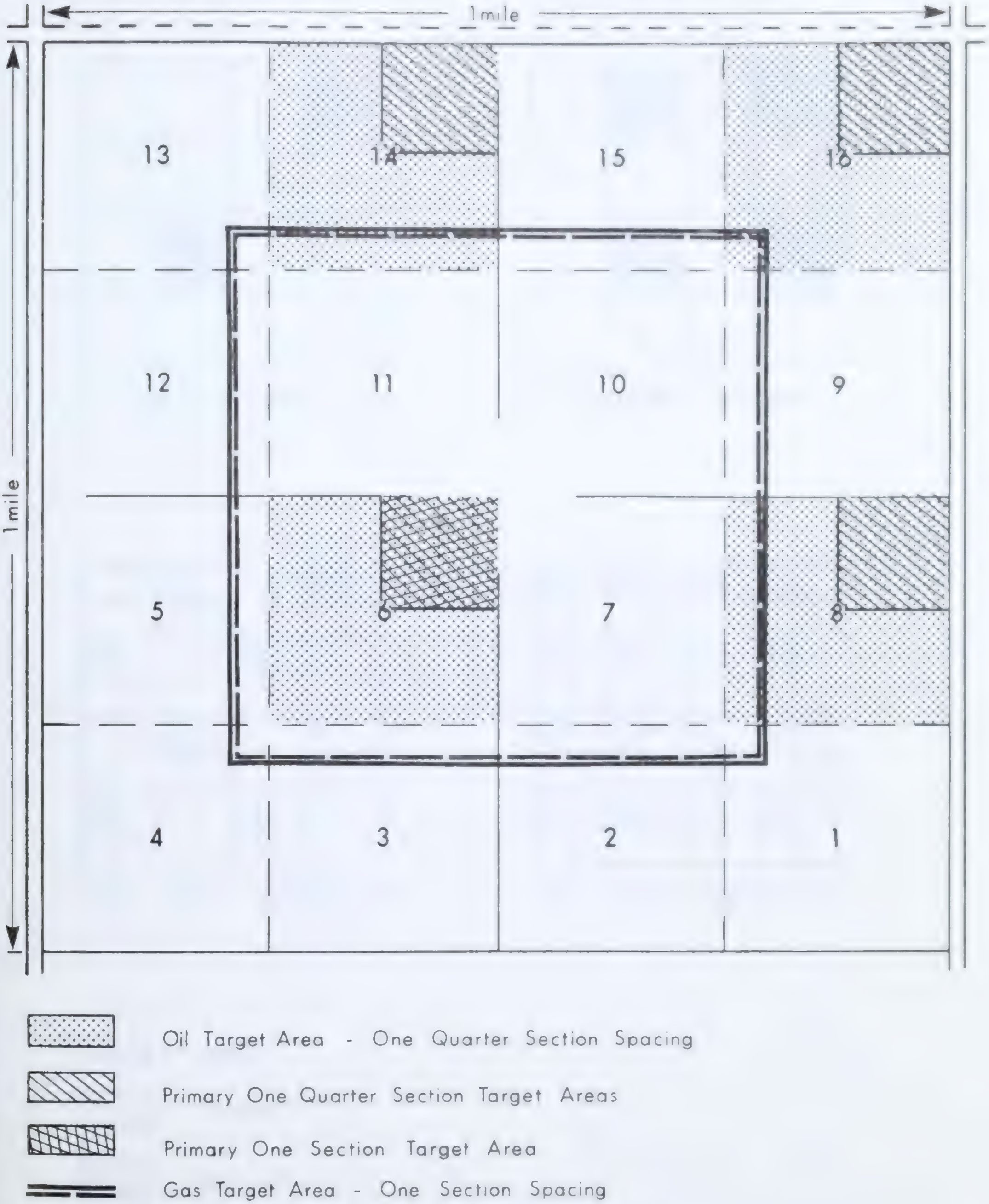

1 mile
1 mile
13
14
15
16
12
11
10
9
5
6
7
8
4
3
2
1
Oil Target Area - One Quarter Section Spacing
Primary One Quarter Section Target Areas
Primary One Section Target Area
Gas Target Area - One Section Spacing

FIGURE 7 TARGET AREAS - GRANDE PRAIRIE AREA

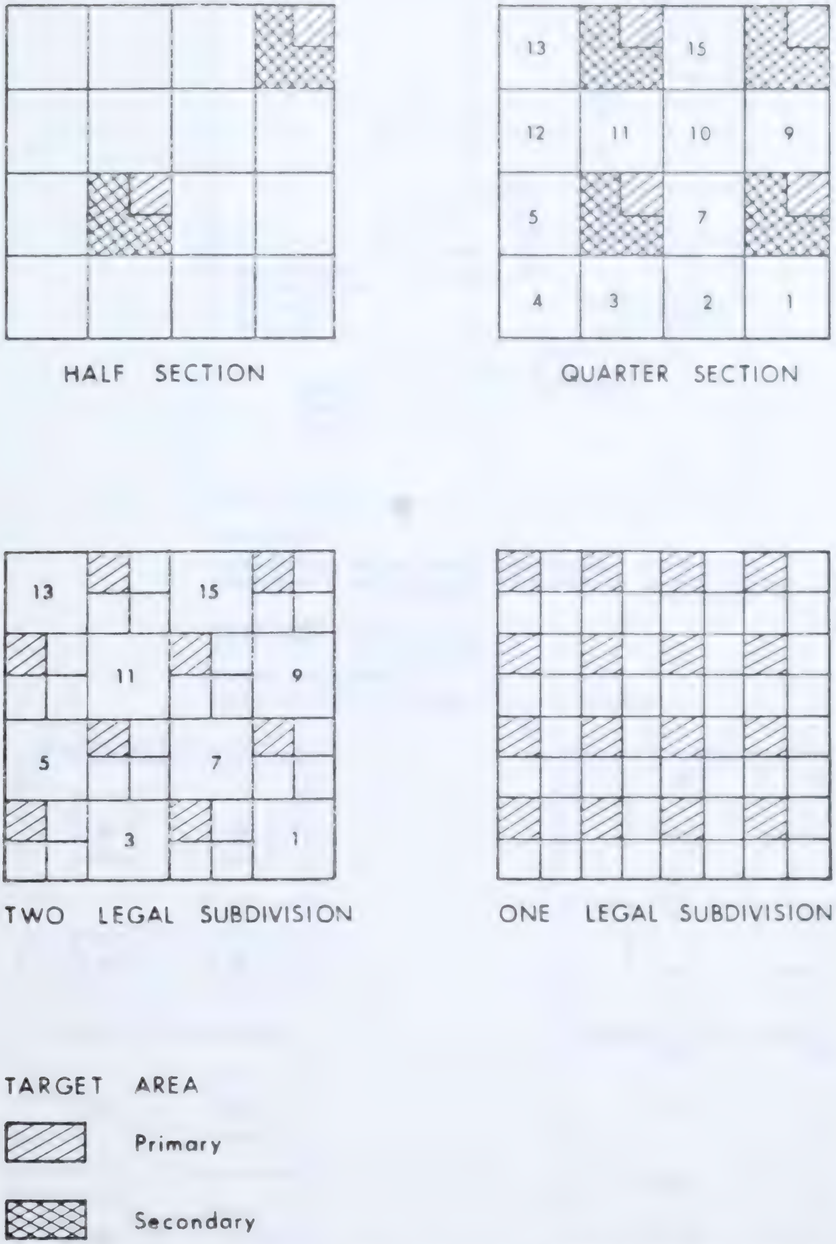


FIGURE 8 DRILLING SPACING UNIT TARGET AREAS FOR OIL WELLS OF VARIOUS SPACING – GRANDE PRAIRIE AREA

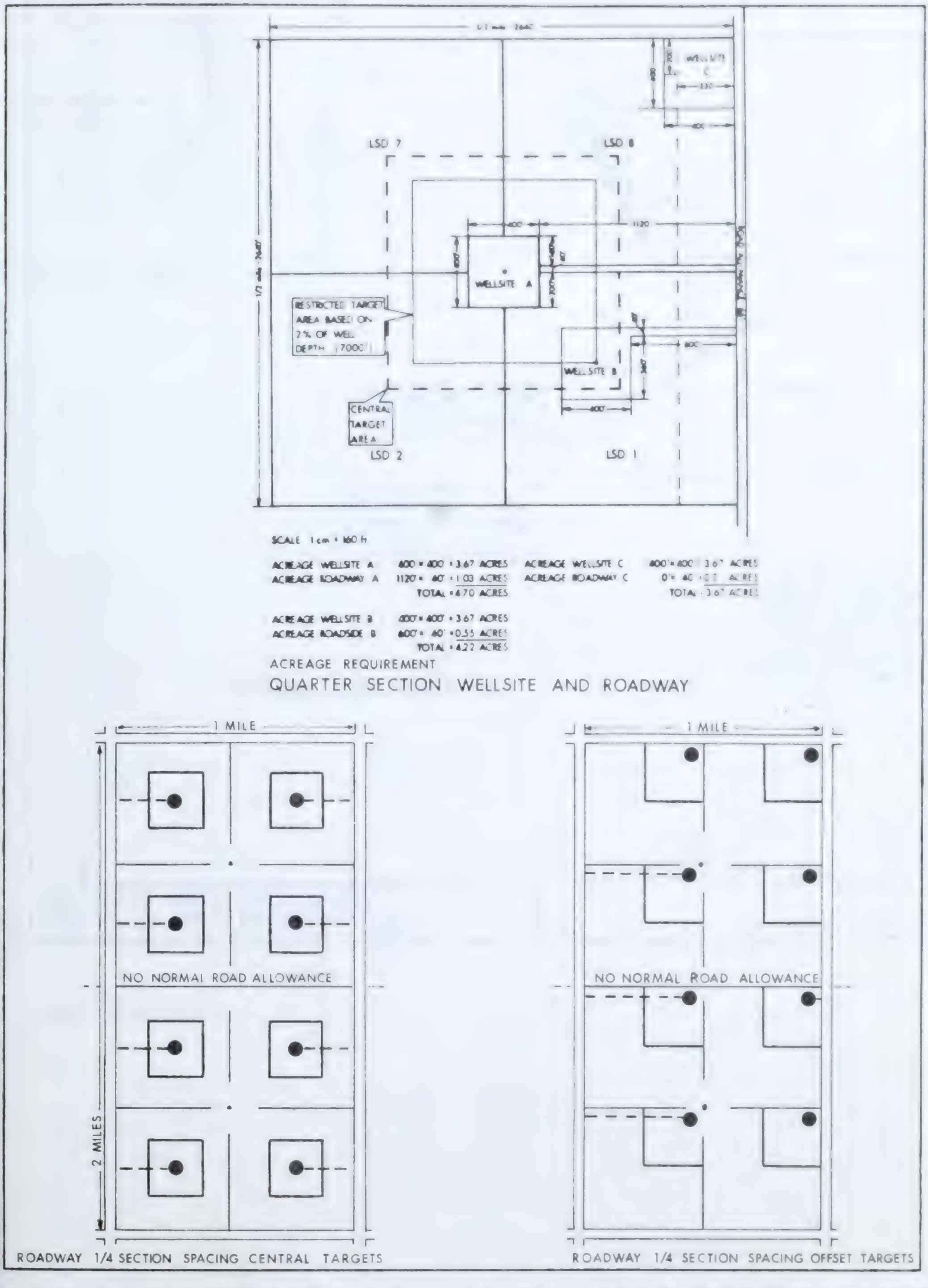
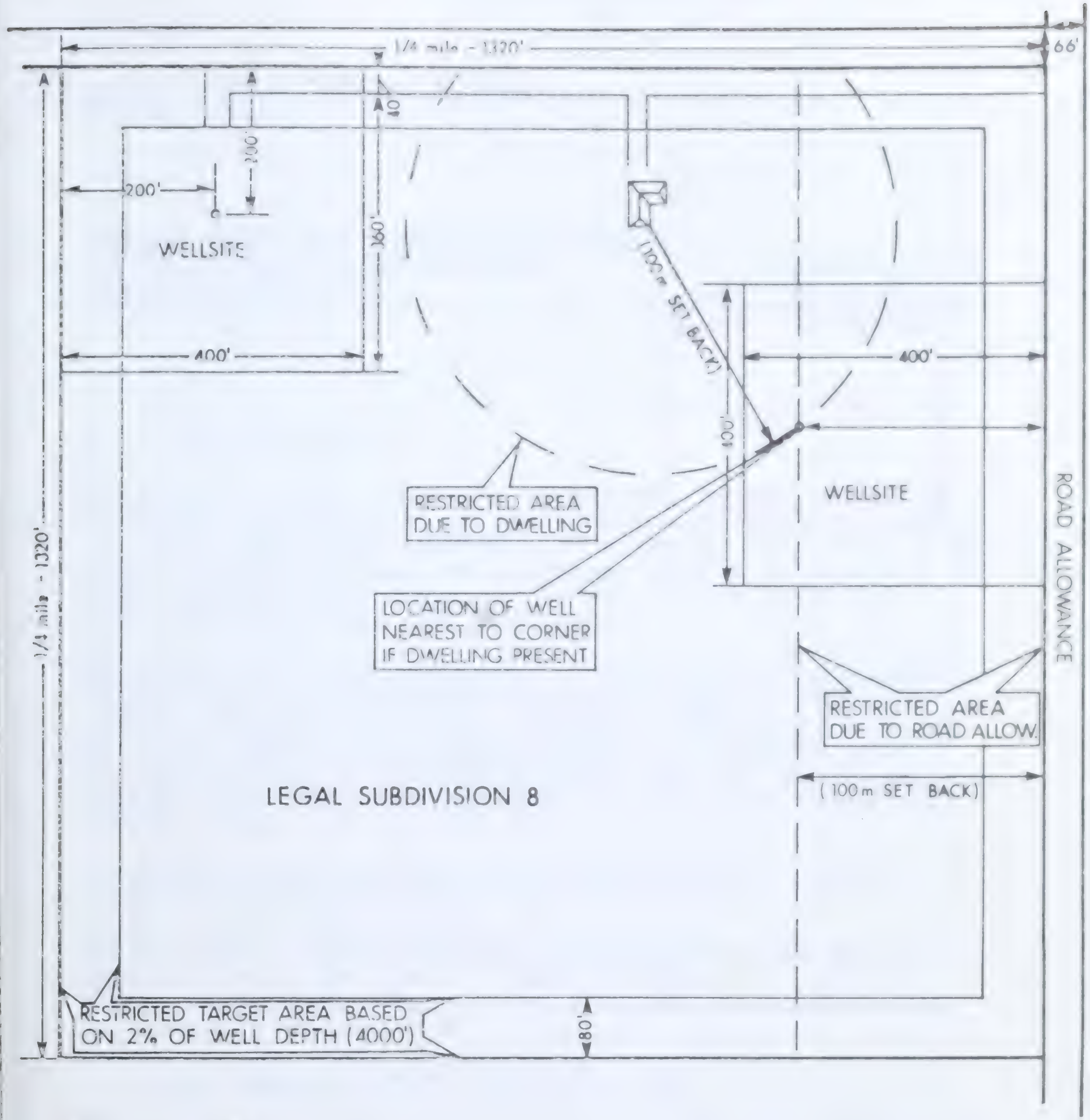

1/2 mile 2640
1/2 mile 2640'
WELLSITE C
330
400
LSD 7
LSD 8
400
1120
400
40'
WELLSITE A
RESTRICTED TARGET AREA BASED ON 2% OF WELL DEPTH (7000')
40'
600
WELLSITE B
400'
CENTRAL TARGET AREA
LSD 2
LSD 1
SCALE 1 cm = 160 ft
ACREAGE WELLSITE A 400 × 400 = 3.67 ACRES
ACREAGE ROADWAY A 1120'× 40' = 1.03 ACRES
TOTAL = 4.70 ACRES
ACREAGE WELLSITE C 400'× 400' = 3.67 ACRES
ACREAGE ROADWAY C 0'× 40' = 0.0 ACRES
TOTAL = 3.67 ACRES
ACREAGE WELLSITE B 400'× 400' = 3.67 ACRES
ACREAGE ROADSIDE B 600'× 40' = 0.55 ACRES
TOTAL = 4.22 ACRES
ACREAGE REQUIREMENT
QUARTER SECTION WELLSITE AND ROADWAY
1 MILE
2 MILES
NO NORMAL ROAD ALLOWANCE
ROADWAY 1/4 SECTION SPACING CENTRAL TARGETS
1 MILE
NO NORMAL ROAD ALLOWANCE
ROADWAY 1/4 SECTION SPACING OFFSET TARGETS

FIGURE 9 WELLSITE AND ROADWAY ACREAGE QUARTER SECTION SPACING


1/4 mile - 1320'
66'
40'
200'
200'
160'
WELLSITE
400'
(100m SET BACK)
400'
400'
WELLSITE
ROAD ALLOWANCE
RESTRICTED AREA DUE TO DWELLING
LOCATION OF WELL NEAREST TO CORNER IF DWELLING PRESENT
RESTRICTED AREA DUE TO ROAD ALLOW.
(100m SET BACK)
1/4 mile - 1320'
LEGAL SUBDIVISION 8
RESTRICTED TARGET AREA BASED ON 2% OF WELL DEPTH (4000')
80'

SCALE 1 cm = 160 ft

FIGURE 10 WELLSITE AND ROADWAY ACREAGE QUARTER SECTION SPACING OFF SET TARGET AREA

① (Alberta

② (

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

DRILLING SPACING UNIT TARGET-AREA REQUIREMENTS FOR OIL AND GAS WELLS DRILLED IN THE PROVINCE OF ALBERTA

Decision 81-20
Proceeding 810078

UNIVERSITY OF ALBERTA
AUG - 7 1981
SCIENCE LIBRARY

1 THE APPLICATIONS

The Energy Resources Conservation Board (Board) received an application by Unifarm, an organization of Alberta farmers, to consider a change in the current target-area requirements to provide for target areas in the corners of quarter sections for oil and gas wells in the balance of the white and yellow areas of Alberta[1] (see Figure 1) not covered by subsisting corner target-area provisions.

The Board also received applications by the Smoky River Surface Rights Society and the Bonanza and Districts Surface Rights Association to consider a change in the current target-area requirements for oil and gas wells to the corner of quarter sections in the specific areas outlined on Figure 2. The Board has dealt with these applications in a separate report, Decision 81-21, which is being released concurrently with this report.

The Board was aware that other surface rights associations were preparing similar applications.

The Board held a public hearing of the applications in Edmonton on 16 March to 20 March 1981 with G. J. DeSorcy, P.Eng., C. J. Goodman, P.Eng., and N. Strom, P.Eng., sitting. The notice of hearing called for representation concerning:

- changes that might be desirable, and
- implementation of any such changes, including application in already developed oil and gas pools and adjacent lands.

Appendix I lists the parties who appeared at the hearing and Appendix II lists those who made written submissions but did not appear or were not represented at the hearing. The Alberta Department of Agriculture filed a submission, pursuant to section 26 of the Board's Rules of Practice.

---

[1] Alberta Energy and Natural Resources designates white, yellow, and green areas as shown on the Public Lands General Classification Map.

At the commencement of the hearing, Amoco made a motion to adjourn to allow it sufficient time to analyze the submissions of the farm groups, and to adequately prepare its evidence, because the concept of changing oil and gas target areas is a complex issue, including conservation, correlative rights, and equity. As an alternative, if the Board were to proceed with the hearing, Amoco suggested that the hearing should be held in two parts; the first part dealing with the submissions of the agricultural groups and the second part dealing with the oil industry submissions which could be held at a later date. Several oil industry representatives spoke in favour of the Amoco motion while a number of agricultural groups opposed the motion. The Board denied the Amoco application on the grounds that sufficient notice had been given and that the subject had been investigated to a considerable degree over the past few years.

2 BACKGROUND

2.1 History of Spacing Changes

Spacing and target regulations originated in Alberta in 1926 when The Mineral Act specified a distance of 400 feet (ft) [122 metres (m)] between wells. In 1938, this distance was changed to 1320 ft (402 m) when fields such as Turner Valley and Taber were actively developed. In 1949, a standard drilling spacing unit (DSU) of one legal subdivision (Lsd) for oil wells was defined with a target area 330 ft (100 m) from the boundaries of the Lsd. The standard DSU for a gas well was defined as one section with the target area 1650 ft (500 m) from the sides of the section.

One-Lsd DSUs for oilwells were still in effect when the first major discovery was made in Leduc in 1947 and the development of such major fields as Redwater, Acheson, Stettler, Bonnie Glen, and Wizard Lake occurred.

As drilling techniques improved and deeper wells were drilled, especially in the western part of Alberta, it became apparent that larger reserves per well were necessary to provide for an economic return with increased drilling and development costs. Furthermore, experience gained from the existing oilfields indicated that the area from which oil would flow towards wells, which is commonly referred to as the drainage area, was much larger than one Lsd. Therefore, to add a stimulus to continued exploration, the standard DSU for oilwells was increased in 1957 to two Lsds for all lands West of the 5th Meridian. The target area was commonly located in the even-numbered Lsd and was identical in size and orientation to that of a one-Lsd DSU.

During the late 1950s, oil production capacity developed much faster than demand and, in an attempt to avoid overdevelopment, quarter-section DSUs for oil were established as the standard size for all undeveloped lands throughout the province effective 1 June 1962. The target area was restricted to a square 330 ft (100 m) from the sides of the southwest Lsd of the quarter section. As a further means of decreasing the number of wells during initial development of large-area pools, oil DSUs of one-half section were established in pools such as Pembina, Willesden Green, and Swan Hills.

An improvement to the concept of drilling and operating only the number of wells needed to drain the pool was introduced in 1964 with the introduction of the production spacing unit (PSU). In accordance with a set of rules, this concept permits the combining of several adjoining DSUs to form a PSU with a somewhat centrally-located producing well. This provision was used to considerable advantage to allow the shutting in of wells in overdeveloped fields and it permitted very wide flexible spacing during development of pools such as Mitsue.

As the continuing search for oil and gas reserves proceeded into the green areas of the province, increasing flexibility to locate wells became more important to reduce road-building costs and the impact on the environment. It was expected that enlarging the target area for a quarter-section oil DSU and a one-section gas DSU would provide for a lesser degree of restriction in locating a well on target for both gas and oil production. Hence, on 1 January 1968, the Board introduced a central target area for the normal quarter section oil well 660 ft (200 m) from the sides of the quarter section and equivalent in area to some 40 acres (ac) [16 hectare (ha)]. The central target area for a one-section gas well was extended on the same date and consisted of the four central Lsds. These target areas for both oil and gas wells are shown on Figure 3.

These enlarged central target areas seemed to provide the industry with the needed flexibility, since relatively few problems were encountered with well locations. However, with the advent in the early 1970s of a very large shallow gas development in southeastern Alberta on quarter-section gas DSUs, it became apparent that a solution had to be found to minimize the interference between rapidly expanding irrigation operations and oil and gas well installations.

Following a hearing in Brooks in 1974, the target area for oil DSUs and smaller than one-section gas DSUs was changed effective 1 June 1974. As shown in Figure 4, the target areas were not decreased in size but were relocated to a suitable corner of the DSU to minimize interference with irrigation operations. The area where this change was implemented is located south of township 31 and east of the 5th meridian. The corner target locations for these lands are specified in Board Order No. SU 800 and therefore are commonly known and referred to in the petroleum industry as the "SU 800" area or "SU 800 target areas".

In 1976, the Board was approached by the Farmers' Advocate and Unifarm to consider the possibility of extending the "SU 800" concept of corner target areas to other parts of the province. The Board considered the requests at a hearing in April 1977. The Board, in Decision 80-8, decided not to shift target areas to corners for the remainder of the province, but did make the following changes:

(a) to improve the flexibility and the opportunity to solve land-use problems, the target area for one-section gas DSUs was further enlarged by 330 ft (100 m) in all directions. Figure 5 illustrates the expanded gas target area and the normal quarter-section oil DSU target area. Figure 6 shows the expanded gas target area and the quarter-section oil target areas within the "SU 800" area, and

(b) applications by either surface owners, farm organizations, or the oil industry to establish a special target area suitable for a specific area, could be made and would be considered by the Board.

In accordance with (b) above, the Board held a hearing at Grande Prairie in 1980 concerning a request for corner target areas for quarter-section oil DSUs and one-section gas DSUs for lands in townships 69 to 76 and ranges 1 to 13, west of the 6th meridian.

The Board determined from the evidence presented that a shift of the gas target was not warranted. However, in the Board's view, the method of farm operations in the area justified the implementation of a corner target area for quarter-section oil DSUs. Although the resulting target areas are similar in size to those in the "SU 800" area, the Board introduced a further modification by prescribing both a primary and a secondary target area. The primary area for a one-section gas DSU consists of the northeast quadrant of Lsd 6, and the secondary area is the remainder of the standard target area. For a quarter-section oil DSU, the prescribed target area is the northeast Lsd. The primary target area comprises the northeast quadrant of the northeast Lsd of the quarter section and the secondary target area thus becomes the remainder of the prescribed target areas. These target areas are illustrated in Figure 7 and have since become known as the "Grande Prairie" target areas.

In the same Decision, the Board decided that, where oil wells were drilled on half-section spacing, the target areas would be consistent with those prescribed for quarter-section spacing. On the other hand, where oil wells would be drilled on closer than quarter-section spacing, the Board decided to shift the target area to the northwest quadrant in an effort to maximize the number of wells which would be along fence lines. Figure 8 illustrates this spacing which is applicable in the "Grande Prairie" area.

2.2 Summary of Current Well Target Provisions

The provisions of DSU target locations and areas applicable today may be summarized as follows:

(a) the corner target provisions as illustrated in Figure 4, for oil DSUs and gas DSUs of less than one-section in the "SU 800" area (South of township 31 and east of the 5th meridian).

(b) the corner and fence-line target provisions as illustrated in Figures 7 and 8, for oil and gas wells in the "Grande Prairie" area (townships 69 to 76 and ranges 1 to 13, west of the 6th meridian), and

c) the central target provisions as illustrated in Figure 5, for standard one-section gas DSUs and quarter-section oil DSUs for all undeveloped lands throughout the remainder of the province, excluding the "SU 800" and "Grande Prairie" areas and those areas subject to local SU orders.

3 ISSUES

The Board considers that the main issues respecting oil and gas well target provisions for the province as a whole are:

- the advantages and disadvantages of changing the currently standard central target area provisions, and
- if there is overall merit to making changes,
  - (i) the new target provisions that should be adopted, and
  - (ii) the timing of implementation.

4 THE ADVANTAGES AND DISADVANTAGES OF CHANGING THE CURRENT STANDARD CENTRAL TARGET AREA PROVISIONS

4.1 Agricultural Industry

Unifarm contended that the location of wells in the middle of fields results in substantial inconvenience, extra work time, a safety hazard, and increased costs to the agricultural industry. Unifarm expressed concern over the land removed from agricultural production or subjected to reduced productivity due to centrally located well sites and lengthy access roads, and the problems of restoring those lands to normal crop production following well abandonment. Unifarm suggested that aesthetic factors of a well site are more difficult to improve upon in the middle of a field than on the periphery. Locating oil and gas wells in the corner of quarter sections would be preferable to landowners and would increase the probability of the owner of a well and the landowner coming to terms privately. Unifarm maintained that various arrangements are available to the petroleum industry in the form of pre-drilling agreements and unitization to alleviate problems of correlative rights and drainage.

The Cattle Commission reiterated the agricultural land-management concerns of Unifarm, and submitted that well sites and access roads in the midst of grazing lands have a negative impact on cattle management by disturbing grazing patterns, subjecting livestock to noise and fright, and serving as an attraction which could result in hazardous consequences. The Cattle Commission expressed concerns over the opportunity for trespassing created by locating wells near the centre of lands. The noise, aesthetics, and interference with the relatively more intensive agricultural management found near the farmyard should be minimized by increasing separation distances and ensuring wells are not directly upwind of farmyards. The Cattle Commission suggested the Board should provide off-target penalty relief, and consider more seriously directional drilling procedures to accommodate the agricultural industry.

The Elk Point Association submitted that if wells were located along the perimeter or in the corners of fields and quarter sections, its primary concern of roads into the middle of fields would be eliminated and land conservation improved. The Elk Point Association suggested the application of directional drilling to reduce disruption of agricultural activities, especially where oil fields were to be developed on 40-ac or smaller DSUs.

A number of other groups presented submissions at the hearing generally supporting the contention that there would be substantially less impact on the agricultural industry if wells were located in the corner of quarter sections, along property boundaries, or adjacent to natural obstructions on the land. Included in this group were: Surface Rights Federation, Blindman Valley Association, Bluffton Association, Bonanza Group, Christian Farmers, County of Beaver No. 9, County of Leduc No. 25, Farmers Advocate, I.D. No. 19, Mountainview Group, M.D. of Bonnyville No. 87 and I.D. No. 18, M.D. of Sturgeon, Mr. O'Ferrall, Parkland Association, Smoky River Group, Three Hills Group, Warburg-Pembina Group, and Willow Creek Group.

Several agricultural industry participants suggested that the 100-m setback of the well from road allowances, other rights of way and farm dwellings should be reduced where it was safe, to enable wells to be located closer to the edge of agricultural lands.

The agricultural industry generally maintained that there would not be an increased impact of the proximity of well sites to farmyards than exists at present if corner target areas were adopted. Some landowners expressed the view that tolerating the nuisance of the drilling of a well near the farmyard for a short time period was less inconvenient than farming around a wellhead for many years.

Mr. O'Ferrall submitted that the most desirable location for a well need not be in the middle of a farmer's field if target areas and spacing were not set in advance of drilling and, there was ample opportunity to select the optimum well site having regard for both the surface and the mineral owners' concerns as well as conservation concerns. Mr. O'Ferrall suggested that maximum flexibility would exist in determining well locations if specific target areas were not set by the regulations.

4.2 Alberta Government Departments

Alberta Agriculture made a written submission under section 26 of the Rules of Practice of the Energy Resources Conservation Board.[1] It maintained that severance and inconvenience caused by current requirements for locating wells in the centre of fields have a great impact on farming operations and tended to reduce crop production.

Alberta Agriculture submitted that wells in the corners of fields would have less impact on the time available for seeding and harvesting, which are critical spring and fall operations where a few hours of delay could result in substantial crop loss. Comparing farming around a well site and a 1350-ft (411-m)-long access road for a well in the centre of a quarter section with a well site in the corner of a quarter section, it estimated the additional time for a parallel and a perpendicular farming pattern would be about 36 minutes and 97 minutes, respectively. The opportunity costs associated with this extra time, should weather conditions become critical to the timing could be significant to the farmer. In general, the further north in the province that the farm is located, the more acute the timing, of seeding and harvesting operations becomes. Alberta Agriculture stated that placing well sites close to municipal roadways significantly reduces the acreage of farmland consumed. The area to be reclaimed upon abandonment, the opportunity for trespass, interference with natural water drainage patterns, intrusion upon the land by overhead powerlines, the potential weed infestation of headland acreage, and the interference with irrigation practices would all be reduced if corner well locations were introduced.

Alberta Energy and Natural Resources, in a written submission, pointed out that corner well locations would decrease the overall impact of oil and gas facilities on the land base. A move to conserve the land and minimize the interference and disruption of other legitimate activities would be in the interest of good land, forest, and wildlife management.

4.3 Petroleum Industry

Dome submitted that by definition in The Land Titles Act, a mineral owner is a landowner in the same manner as a surface owner. It therefore contended that wells should be located in the centre of a DSU to protect the equity of the mineral lease owner, to permit optimum exploration and the production of minerals discovered on the whole of the parcel. Dome submitted that it is seriously concerned about the potential impact of mixed target areas which would result if a change of target area were made in existing developed pools. It submitted that the results of a model reservoir study assessing the effects for a five-spot waterflood pattern, with the injection well centred as compared with the injection well moved one-half the distance to one side of the pattern or moved all the way to the edge of the pattern, indicated recovery losses through reduced sweep efficiency of one-tenth and one-fifth respectively. For an actual pool, however, Dome said the relative losses could be less than indicated in the study, as patterns around the periphery of a pool may be incomplete and slightly skewed patterns exist anyway because wells are located in different portions of their target areas.

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[1] Section 26, Rules of Practice of the Energy Resources Conservation Board states "Where the Board receives a statement by a department or agency of the Provincial government and a copy thereof is supplied to the applicant and each intervener, it may, notwithstanding the other provisions of these Rules, receive the statement in evidence, whether or not it is filed or presented in accordance with these Rules."

Dome stated that the Bonanza Boundary A Pool (Bonanza pool) demonstrates potential effects of non-uniform patterns and incomplete patterns in the extreme. First, the pool is long and narrow, resulting in substantial perimeter area losses. Second, due to the central half of the reservoir having extremely poor accessibility because of topographical problems, the existing wells have been drilled in many different positions within their target areas, resulting in skewed drainage areas. Five new wells are required to complete the six patterns that would be necessary to waterflood the pool. The recovery losses that could occur if the five wells were drilled on corner rather than central targets was estimated by Dome to be 250 000 barrels (bbl) [40 000 cubic metres (m^3)] of oil, or roughly 50 000 bbl (8 000 m^3) per well.

Dome stated that the development of heavy-gravity oil pools would occur on spacing of less than 40 ac (16 ha) and would require uniformly spaced wells in order to drain the highly-viscous heavy oil from the reservoirs. The use of tertiary recovery schemes utilizing thermal methods would necessitate well-spacing requirements in the order of 10 ac (4 ha) ie, 16 uniformly-spaced wells per quarter section. Under such intensive drilling it would be impractical to avoid the middle of fields. From an engineering and economics view, if directional drilling were justified in the heavy oil area, Dome submitted that it would require some 16 drilling pads on a section of land which would place some of the pads out on the fields. A well directionally drilled to a centre or a corner target area would not change this situation. Further, because of the typical shallow vertical depth of production in the heavy oil areas, directional drilling from the fence lines to the centre of fields will not be possible due to the relatively long horizontal distances involved.

Dome stated the existing regulations, which provide maximum flexibility for locating wells, are optimum for surface and subsurface considerations. Dome maintained that the entire target area, rather than a primary and secondary target area as at Grande Prairie, should be available to the industry to enable the most desirable technical location to be selected and drilled without the delays associated with lengthy negotiations or the hearing process. Dome pointed out that time deadlines are often critical owing to competition within the petroleum industry and expressed concern that any changes that would restrict ready access to the entire target area might cause an operator to accept a technically less desirable location as a matter of expediency. Instances where timing of drilling could be critical including actions preparatory to crown land sales and meeting drilling obligations for expiring leases.

Dome's experience in the green zone, and in particular the eastern slope area of Alberta, was that the existing central target areas, including the common overlap of oil and gas targets offered the best flexibility to satisfy, not only the petroleum industry, but also, the concerns of the forestry and coal industries and the provincial departments and agencies having jurisdiction with respect to forestry, environment, and fish and wildlife management.

Dome submitted that interference with farmsteads is minimal with centrally-located wells and that as wells are moved towards the peripheral areas of a DSU the probability of conflict between farmsteads and the target areas rises. It suggested that the increased acreage requirements under centrally-located wells compared to corner wells is small due to the common practice which permits farming of over half of the lease acreage around wellheads and access roads. Also, Dome contended that with corner target areas and associated fence-line roads, essentially all of the lease is unfarmable. The problem of weed control thus becomes a greater problem for both landowner and operator since the roadway and well sites cannot be readily cultivated. Dome noted that inconvenience and loss is also a matter of compensation to the landowner.

PanCanadian submitted that the existing central normal target area pattern minimizes equity problems in areas where mineral and surface ownership is not in large contiguous land parcels. PanCanadian acknowedged that it would be helpful to the agricultural industry to know for planning purposes that wells would be in the corners of fields. PanCanadian suggested, however, that there would be little gain by the agricultural industry in terms of land conservation and that the main concern appeared to be to minimize inconvenience to farming operations. It stated that in balancing the advantages and disadvantages of a change, if it became evident that a change would adversely affect recovery of petroleum resources, then a change should not be made. PanCanadian noted that loss of recovery of a petroleum resource is not compensable whereas surface-land impact is a compensable item. It submitted evidence suggesting that an anticipated 600 000 bbl (95 000 m^3) reduction of recovery could be expected in the Wembley Halfway B oil pool (Wembley pool) as a result of the 1980 target-area shift from central to northeast locations. It modelled the pool to determine the effect on recovery for a 30-year period for waterflood and miscible-flood depletion schemes in which there was an equal number of producing and injection wells. Maximum recovery was predicted, utilizing a waterflood depletion scheme with normal well spacing and central target areas, compared to depletion under waterflood with one-quarter of the wells on central targets and three-quarters of the wells on corner target areas. PanCanadian submitted the loss was significant, and additionally, it had the most serious effect on PanCanadian's acreage where it would be in the order of 400 000 bbl (64 000 m^3).

PanCanadian submitted that an equity problem does not exist in the southern portions of Alberta covered by SU 800 due to its larger blocks of common ownership where the geology of gas formations is consistent across large areas, thus minimizing lease boundary effects. Also, the oil deposits are relatively small and are usually classified as heavy oil. Hence, development is on 40-acre spacing and since individual pools were usually drilled out prior to 1974, the mixing of target areas was avoided.

PanCanadian stated that the equity question in the Grande Prairie area is minimized by the rather large mineral lease holdings averaging seven to eight sections, but problems will exist along lease lines and in the Wembley pool where there may also be a conservation problem due to non-uniform targets. It also examined farming communities throughout central Alberta north of township 31, including Red Deer, Stettler, and Edmonton, where virtually all of the freehold royalty lands exist and where individual leasing has resulted in widely diversified working-interest ownership. PanCanadian found 85 per cent of the mineral leases to be smaller than one section. PanCanadian expressed the view that due to the large freehold situation in this area mixed in with crown mineral holdings, the equity problem might be compounded if central target areas were not maintained.

The Canadian Petroleum Association, Independant Petroleum Association of Canada, and companies including Amoco, Chevron, Hudson's Bay, Shell, and Western Mines supported the positions of Dome and PanCanadian that the existing system of central target areas offers the agricultural and petroleum industries the widest flexibility and should be maintained.

Chevron stated in closing argument, that the benefits to be gained by the agricultural industry in shifting to corner targets are not sufficient to justify such a change. It believed that many of the complaints of inconvenience, higher farming costs, and good acreage being unnecessarily taken out of production are holdovers from the past and do not correctly reflect current leasing conditions, remuneration, lease operation, and reclamation practices.

Esso supported a change to corner target areas provided any new provisions are sufficiently flexible to deal with the concerns of the petroleum industry respecting equity, geological interpretations, predictable hole deviation, topographic conditions, and clustering of wells adjacent to already developed oil and gas pools or previously drilled wells. It was not thoroughly convinced that adopting corner targets would solve all the problems expressed by the agricultural industry, particularly in areas where close well spacing is required. The continuing necessity to drill wells will inevitably interfere with the surface of the land. However, Esso noted the farming community appears to be convinced that corner target areas will result in significant improvement.

Esso submitted that the suggestion that well sites be located along the perimeters of sections and that directional drilling be used, is not practical. There are, Esso concluded, only a limited number of situations where directional drilling is both technically and economically feasible.

All of the petroleum industry participants objected to the proposal by Unifarm and other agricultural industry groups that the target area for the one-section gas DSU be moved to the northeast of the section. They submitted that it is necessary to locate gas wells near the centre of the section in order to adequately prove up and drain underlying reserves. Severe equity problems would result if the target areas were shifted to the northeast corner. Also, a target-area shift for the standard gas DSU to the northeast corner would work a serious disadvantage to a mineral owner having rights to any portion of a section other than the northeast quarter. The absence of a prescribed target and the ensuing off-target penalty rules would adversely affect his opportunity to produce gas relative to that of the owner of the northeast quarter.

4.4 Board Views

4.4.1 Impact on Agriculture

The Board understands that the major concern of the agricultural industry is that of the effects of land severance and extra headlands on farming and ranching operations that are caused primarily by well-access roads. Additional important concerns respecting impact on agriculture include: actual amount of land consumed by well sites and access roads; well site target locations in relation to farm sites; and well site setback requirements in relation to municipal roads, power lines, pipelines, etc.

It is generally agreed that irrespective of its location, the area required for a well site will be more or less a constant. From a comparison of a two square mile area, subject to quarter-section spacing as illustrated in Figure 9, the Board concludes that the northeast corner target orientation would result in a combined reduction in lease roadway requirements of approximately two ac for the eight wells. Also, a nominal reduction in the acreage required for well sites might be realized if the wells were placed immediately adjacent to municipal road allowances. However, as illustrated on Figure 10, existing setback requirements prescribed by the Oil and Gas Conservation Regulations normally place a well 100 m from the road allowance, and this setback may be further increased if a dwelling or other surface improvement exists near the proposed well site. The Board's overall view is that the corner target orientation would permit only modest savings in acreage consumed by well sites and roadways.

The Board agrees with the agricultural industry that the result of the extra headlands, overlapping of farming operations, increased turning to circumvent obstacles and other inconveniences and nuisances resulting from wells being located in cultivated fields, reduces production and increases operating costs. These inefficiencies are particularly the result of the access roads. The Board recognizes that these effects, like acreage losses, could be compensated for by the lease agreement, but they nevertheless would continue to be a regularly visible source of concern to the landowner. The Board thus believes that while the direct benefits in terms of reduced impacts by moving well sites out of the centre of quarter sections might not always be very large, the indirect ones especially relating to well access roads are significant over the long term.

The Board agrees with the Cattle Commission that the impact on cattle operations of corner well locations would be less than that of well sites located in the midst of grazing and haying areas. The Board considers that corner locations would further minimize the opportunity for livestock harassment and trespass on grazing and other farmlands. In most instances, fencing of well sites would assist in minimizing trespass. However, the Board has observed that it is frequently of mutual benefit to the landowner and the petroleum industry to leave access roads and leases unfenced for reasons of weed control and maintenance.

The Board notes from the evidence presented during the hearing that it may be slightly more common to find farm dwellings located within or near corner target areas than central target areas. Also, the Board notes that several agricultural industry representatives contended that they would rather have the nuisance for two or three weeks of a well being drilled near the farmyard, than the nuisance of a wellhead in the middle of the field for many years. On these considerations, the Board concludes that there would be little difference in impacts for either corner or central target areas.

The Board recognizes the point expressed by the petroleum representatives that the existing 100-m setbacks from municipal road allowances now set out in the Oil and Gas Conservation Regulations would, irrespective of other changes in target provisions, force many well sites to be located inside rather than at the very edges of agricultural land parcels. The Board now believes that this amount of setback should be reviewed as it is evident that it causes undesirable intrusion on land use and also may be unnecessarily large for today's land-use environment. The Board notes that it was indicated during the Grande Prairie proceeding, that perhaps a revised normal setback of 30 m would suffice for most purposes except for human dwellings.

In summary, respecting impact on agriculture for standard quarter-section spacing, the Board sees reduced impact from corner target areas due to modestly less land being used, less land severence, reduced access road problems, lessened impact on farming operations, and a reduction in general nuisance.

The Board notes that for gas wells on one-section spacing, the current central target area provides considerable opportunity to locate wells and access roads along quarter-section boundary lines. Thus, the advantages to the agricultural industry of shifting the gas target from the centre of the section to the northeast corner appear to be much less significant than the advantages of shifting oil targets away from the centre of quarter sections. Nevertheless, it should be noted that if gas wells are drilled on quarter-section spacing, their target areas would be identical to those for quarter-section oil spacing.

The Board recognizes the advantages to the agricultural industry of directionally drilling a well from a surface location on the periphery of a quarter section or outside the parcel of land. The main advantage of such a well would be a shorter access road and thus some reduction in the interference with surface operations. On the other hand, the Board agrees with the petroleum industry that the risk of directionally drilling exploration or evaluation wells may not be warranted because of technical limitations or economics. Consequently, the Board believes it proper to only consider the merits of directional drilling on a site- or project-specific basis.

4.4.2 Impact on Recovery of Oil and Gas

The Board believes that where there is not a conflicting spacing change within a pool, the amount of resources encountered by wells and the efficiency of drainage or recovery would, on balance, be equal whether a pool was drilled on corner or central target areas. The Board notes that the provision of central targets for quarter-section DSUs, standard for oil, may cause irregular patterns to occur for subsequent development on closer well density whereas the smaller primary target area associated with a shifted target would reduce this tendency. Considering that the prospects for future reduction in oil DSUs are significant, the Board suspects that corner target areas for oil may be relatively advantageous for future oil recovery.

The Board considers reasonable the estimates by PanCanadian and Dome that ultimate recovery of reserves could be reduced by some 600 000 bbl (95 000 m^3) in the Wembley pool and by some 250 000 bbl (40 000 m^3) in the Bonanza pool if central targets were converted to corner targets during the development of the pools and also assuming no future reduction in well spacing, no drilling of infill wells, and rigid use of primary targets.

The Board considers the Bonanza pool to be a reasonably delineated pool with 9 of a possible 31 locations yet to be drilled. If target areas were shifted, and again assuming no future infill drilling, the Board believes the principal recovery loss in the Bonanza pool would occur from the unswept areas along the southwest flank which are not offset by increased sweep along the northeast flank. To minimize such losses, future wells might have to be drilled on the outer edges of a secondary shifted northeast target area, while others might be located in a more central position.

The Board recognizes that including the Wembley pool in the shift to the northeast target area when only 20 of a possible 80 wells had been drilled could result in some inefficient flood-pattern development. However, the Board concluded in its Decision Report 80-8 for the Grande Prairie area, that where necessary to accommodate special problems, locations outside the primary target area should be utilized. It further stated that, since part of the northeast target area is within the subsisting target area, a well under the revised target-area provisions could be drilled on a pattern that is largely compatible with that already established. The Board was of the opinion that by applying the target-area change to the Wembley oil pool, many of the remaining wells could be located in a manner that would reduce the impact on farming operations without having a serious impact on either oil conservation or equity. The Board believes that conservation losses could be significantly lower than estimated by PanCanadian if secondary target areas were used. The Board, however, is prepared to consider target areas away from the northeast corner in Wembley on the basis of the merits of each particular case, including a recognition of impact on oil recovery, future need for infill wells, and effects on surface operations.

4.4.3 Impact on Equity

The Board considers a serious equity problem could exist where changes in target areas occur within a pool and in an area of mixed ownership. The majority of oil pools in the province were drilled out long ago and would not be affected by a shift in target area. Applying corner targets to newly discovered oil or gas pools would allow the same degree of uniformity in spacing as now exists. However, there remains an equity problem to some extent because minerals are leased on a legal survey basis and corner or fence-line target areas would mean capture of part of the leased minerals and part of those in some other lease. This is more of a problem where lands have been purchased in the past but is random in the sense that any one operator might benefit in some areas and suffer a loss in others. The affect of non-central targets has been long present for areas such as Pembina and Swan Hills developed on the southwest target locations for oil and, furthermore, has influenced the administration of PSUs that incorporate undrilled DSUs. Overall, the Board does not view the equity problems that would result from a change in target areas for oil DSUs as serious except in portions of pools with both mixed target areas and mixed ownership. The Board also notes that for gas wells, because gas flows more freely in a reservoir than does oil, and because normal DSUs are so much larger (one section), the equity problems with non-central targets are greater than for oil. Gas pools are sometimes developed on half-section or quarter-section spacing to permit drainage of low quality reservoirs. In these circumstances, because the well-drainage radius is relatively small, a shift in the target area for the gas DSUs should not cause serious equity problems.

4.4.4 Impact on Flexibility in Exploration

The Board considers that any change to target areas which would reduce the common area of the oil and gas target would reduce flexibility for exploration. This is a function of the extent of the area of overlapping gas and oil target areas and not a function of whether the common target area is in the corner or centre of the section, since oil and gas occurrences are random with respect to the survey system. In considering a possible shift of target areas, the Board investigated several alternatives which would increase flexibility in exploration. One alternative considered was an increased target area size. The Board also considered Mr. O'Ferrall's suggestion for complete flexibility by not prescribing any set target area.

The Board has concluded that a shift of target areas to the corner for oil wells but not for gas wells would cause reduced flexibility in locating exploration wells. However, the Board does not believe this disadvantage is so great as to cause it to either not shift the oil target area or, alternatively, to shift the gas target area along with the oil target area. Notwithstanding that general conclusion, the Board appreciates that there would be advantages in providing a more flexible attitude toward well-target provisions where land-use problems have been fully resolved and it is not possible to reasonably predict the likelihood of oil or gas being found. The Board intends to pursue this problem in the next few months with a view to issuing a guideline informational letter thereon.

4.4.5 Summary of Board Views

After weighing the evidence, the Board concludes that:

(a) the positive impact to the agricultural industry of moving target areas for oil wells closer to fence lines and the compatibility of corner targets, if accompanied by a primary target area, to future reduced well patterns generally outweighs the negative impact of such a move on equity and flexibility for exploration, except in some instances where significant mixed target areas and mixed ownership occurs. Therefore, a shift in oil target areas for quarter section and smaller DSUs to allow more fence-line wells is warranted,

(b) for gas wells, the advantages to the agricultural industry of shifting targets from the centre to the corner of a section of land appear rather limited while the impact on the subsurface mineral owner in terms of both equity and efficient drainage are significant. Thus, a shift in target areas for gas wells should not be made,

(c) corner target areas would change the configuration and location of the common target areas for oil and gas, resulting in some reduced flexibility in selecting well sites especially in the northeast quarter section. This reduced flexibility could result in some restrictions in exploration and solutions to this problem will be pursued further during the next few months,

(d) the decision to directionally drill a well or group of wells, since it often involves unusual cost considerations, should be evaluated on a site by site basis having regard for specific technical, economic, resource recovery, and land-surface considerations, and

(e) the current 100-m setback provision restricts opportunities to drill near quarter-section boundaries and should be reviewed by the Agriculture-Petroleum-Government Committee[1] to determine the feasibility of a considerable reduction.

5 DESIRABLE CHANGES TO SUBSISTING TARGET AREA PROVISIONS

5.1 Agricultural Industry

Unifarm preferred that target areas for oil and gas wells be restricted to the extreme northeast Lsd of the DSUs with a designated primary and secondary target area. Unifarm proposed that the primary target area should be the northeast quadrant of the Lsd and the secondary target area would be the balance of the Lsd. Unifarm maintained that shifting both oil and gas target areas would enlarge the common target area and substantially increase the flexibility in locating a well on target. Unifarm recognized that under certain circumstances the northeast corner target area would not be satisfactory and suggested such instances be dealt with individually by application to the Board.

Unifarm suggested that, in instances where conservation issues, correlative rights, and other problems were significant, unitization, pre-drilling agreements or other contractual arrangements were available to the petroleum industry to resolve such problems.

Unifarm submitted that any new target-area orientation should be extended to the balance of the white and yellow areas of Alberta (as designated by Alberta Energy and Natural Resources, Public Lands General Classification).

The Cattle Commission expressed support for the concept of corner target areas with a primary and secondary target area for oil and for gas wells. The Cattle Commission proposed that wells should be located as close as possible to the northeast corner of sections and quarter sections and to road allowances. It acknowledged that geological data, surface configurations, and smaller DSUs might be legitimate reasons for limiting the potential location for a well site but requested that the landowner's concerns be viewed as important reasons for selecting a well site.

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[1] A twelve-member committee recently established to address a number of problems of mutual concern including land reclamation and minimizing land-use impacts. Terms of reference and members of the committee are included in Appendix III to this report.

The Christian Farmers stated that equity considerations should not be a sufficient reason to maintain target areas in the centre of fields, and therefore, it favoured shifting both oil and gas target areas to the northeast quadrants of a section. The Christian Farmers favoured a primary common oil and gas target area in the north and east half of Lsd 16, and thought the second best common oil and gas target area would be the north half of Lsd 9.

The Elk Point Association contended that the surface location of well sites should be on the perimeter of fields and quarter sections with the well directionally drilled to the target areas. The Elk Point Association also endorsed corner target areas as an improvement over the present central target areas.

Generally, the other farm groups endorsed the concept that the target areas for quarter-section DSUs should be located in the extreme northeast corner of the DSU or along property boundaries. In many cases the farm groups favoured a corresponding shift of the one-section DSU target area to the northeast portion of the section. They generally requested a primary target area in the northeast quadrant of Lsd 16 to ensure corner well sites as often as possible. They generally agreed that it would be inappropriate to change the target position for lands already drilled, as any such shift would incur additional land segmenting if further drilling were to occur.

Mr. O'Ferrall submitted that the size of the DSU or optimum well density should be established in accordance with the characterisitics of the reservoir rock and fluids, and conservation issues. He submitted that target areas should not be established in advance and that the location of any particular well to be drilled should be determined only after considering the use of the surface, the impact of a well on that use, correlative rights of mineral owners, conservation and such further geological considerations as may influence the optimum well location. Mr. O'Ferrall recognized that as an area is drilled, the flexibility with respect to well location would be reduced, but maintained that there should not be a pre-established target area within any spacing unit.

5.2 Alberta Government Departments

Alberta Agriculture submitted that the pattern established by Decision 80-8, Drilling Spacing Unit Target Area Requirements for Oil and Gas Wells in the Grande Prairie Area, should be adopted throughout the province, including the irrigation areas, for all new oil wells on arable and potentially arable lands. Alberta Agriculture recommended that the 250-ac (112-ha) gas target area be shifted to the northeast corner of the section with the primary target area being the northeast quadrant of Lsd 16.

Alberta Energy and Natural Resources suggested in its letter that the present target area overlap of one-section and quarter-section DSUs be retained. However, it recommended shifting the pattern within the section so as to alleviate surface conflicts. It suggested there be a degree of flexibility to consider inherent variations and to meet the needs of both surface and subsurface owners.

5.3 Petroleum Industry

Dome Petroleum submitted that further revisions to standard target areas for oil and gas on a province-wide basis are neither warranted nor desirable. Dome stated that, if the Board agreed with the proposals of the agricultural industry, any such revisions to standard target areas should be restricted to agricultural areas only and not apply to the "Green Zone", and that exceptions should be made for developed pools and for the heavy oil district.

Dome proposed a heavy oil district extending from townships 31 to 65, ranges 1 to 10 west of the 4th meridian, inclusive. Dome submitted that the maximum potential recovery of heavy oil would only be realized on 40-ac (16-ha) spacing with four uniformly spaced wells per quarter section draining the heavy oil reserves from the reservoir. Extensive use of tertiary recovery schemes utilizing thermal methods will be required to further maximize oil recovery for many of the shallow heavy oil pools and this will necessitate well spacing of 16 uniformly spaced wells per quarter section. Such spacing would, Dome submitted, render corner target areas impractical.

Dome submitted that, if a change in target areas were necessary or desirable, such change should be made on the basis of the target areas prescribed in SU 800 for southeastern Alberta where primary and secondary target area designations do not exist. Dome stated the designation of a primary target area, as in SU 1040 for the Grande Prairie area, is undesirable because it restricts the flexiblity needed to accommodate the landowner and the proponent of the well.

PanCanadian submitted that it preferred retention of central target areas, but recognized the potential need for special target provisions in unique circumstances. If a change to the target area were considered necessary, PanCanadian proposed that consideration should be given to the potential for future 80-ac or 40-ac (32-ha or 16-ha) spacing. It further suggested that primary target areas might be established in the extreme corner of each quarter-section DSU, with central interwell distances prescribed rather than specific target areas. Once the first well had been drilled, future locations could be selected towards the centre of the section or near the corners.

The balance of the petroleum industry representatives, except Esso, did not agree with the concept of the shift of the target area for oil and gas wells to the northeast corner of quarter sections, nor did they agree with the proposed restrictions regarding primary and secondary target areas. The petroleum industry contended that maximum flexiblity was essential for exploration.

Esso recommended that the corner target-area provision of SU 1040 in the Grande Prairie area be extended to other areas of the province except for the Green Zone, the areas adjacent to already developed oil and gas fields and previously drilled wells, and to the area of southeastern Alberta covered by SU 800. Esso also requested that any revisions be sufficiently flexible to deal with site-specific concerns respecting conservation, geological and topographical situations, and equity.

The petroleum industry representatives generally submitted that a change in target area pattern should not be made in the Green Zone and in particular in the eastern slope area, even if changes are made elsewhere. The existing target-area configuration with its overlapping common areas provides, in these areas, necessary flexibility to satisfy the concerns of the forestry and coal industries, and the provincial departments and agencies having jurisdiction with respect to forest, environment, and fish and wildlife.

5.4 Board Views

The Board considers the proposals of the agricultural industry to adopt corner target areas for oil wells to have significant merit in many situations and in many areas of the province. However, the Board believes that restricting target areas to the extreme corner of a DSU as proposed by Alberta Agriculture or along property lines as suggested by the Elk Point Association is too restrictive and could result in serious oil and gas conservation and equity problems.

The Board considers that the central target for one-section gas spacing satisfies many of the concerns of the agricultural industry since it permits drilling of a well near quarter-section boundary lines or near the centre of a section where access roads could follow quarter-section boundaries. Consequently, the Board is not prepared to shift the one-section gas target area.

To encourage a well to be located as close as possible to the corner or the boundary of the quarter section, the Board believes that the target area can be divided into primary and secondary areas as was done at Grande Prairie and as illustrated in Figure 7. The primary target area for quarter-section spacing would be the northeast quarter of the northeast Lsd. The secondary target area would be the remainder of the northeast Lsd. The target area for a one-section DSU would have a primary target area in the northeast quarter of Lsd 6. The secondary target area would be the remainder of the one-section target area.

Locating a well in the primary area is preferred and would be automatic with the agreement of the surface landowner. Since the primary area is the target area subscribed to by the majority of the agricultural groups, the Board would expect such agreement would be readily available. For the secondary target area, proposed wells would also be approved if agreed to by the surface landowner. Where such agreement did not exist, the Board would consider the application in the light of the landowner's objections to the location and the applicant's geological or other evidence supporting the request. In such instances, a simplified hearing procedure could be used that would only require the presence of the Board representative, the proponent of the well, and the landowner, with a decision being made immediately. This procedure, when judged appropriate, will be used from the date of this decision.

For spacing of less than one-quarter section, the Board considers it desirable to adopt a northwest orientation of target areas in the effort to maximize fence-line opportunities for wells. This is consistent with what exists in the Grande Prairie area and is illustrated in Figure 8.

In summary, the Board finds that for the white and yellow areas of Alberta the well spacing provisions for quarter-section DSUs should be amended to provide for northeast target-area orientations and classification of the target areas into primary and secondary areas as shown on Figure 7. For smaller spacing, the target area would be as shown on Figure 8. The Board further concludes that the one-section DSU target area for gas wells should remain on a central pattern with the primary target in Lsd 6 as shown on Figure 7.

The Board considers mixing target-area patterns in pools that have been fully delineated and substantially developed to be generally inappropriate except in specific cases where it can be established that there would be minimal impact on conservation and equity and it would significantly reduce land-surface impact. For this reason, the Board will exclude from any target-area change, lands within Board-designated oil pools as of a spefic date. The reason for not excluding currently existing gas pools is that no change is being made to gas target areas.

The Board recognizes that there may be lands outside declared pools where the industry believes a retention of central targets is appropriate. The Board would expect these to be brought before it in specific applications with supporting evidence. Similarly, there may be areas within designated oil pools where landowners believe corner target areas are justified. In either case, requested changes would be considered by the Board only after giving directly affected persons an opportunity to speak to the matter.

The Board considers it in the public interest to retain an appropriate requirement for setback from the target-area boundary to accommmodate normal wellbore deviations and from surface improvements to ensure public safety. The Board recognizes, however, that the current 100-m setback may be an overly conservative restriction and that it might be reduced to perhaps 30 m as was suggested at the Grande Prairie hearing. The Board plans to refer this question to the Agriculture-Petroleum-Government Committee. In the meantime, the Board is prepared in certain situations to consider relaxing its 100-m setback requirement upon written request and consent of the proponent of the well, the landowner and any other member of the public whose rights might be affected.

6 IMPLEMENTATION OF THE REVISED TARGET AREAS

6.1 Agricultural Industry

When implementation of any revisions was addressed by the farm groups, they encouraged speedy implementation to minimize the impact of future drilling on agricultural operations.

6.2 Petroleum Industry

The petroleum industry suggested that if target-area changes were to be considered, the implementation should be delayed until the full impact of the Grande Prairie changes were known and understood.

6.3 Board Views

The Board sees no valid reason to delay target area changes and believes that the changes described in section 5.4 should be implemented immediately.

7 DECISION

After considering all of the evidence, the Board has decided:

(a) that the target areas for DSUs of less than one section should be changed to provide for target-area orientations and primary and secondary target areas as described in Figures 7 and 8,

(b) that the target area for one-section spacing should remain in the centre of the section and should have a primary target area as shown in Figure 7,

(c) that the changes will be effective for all white and yellow areas of Alberta, as shown on Figure 1, exclusive of lands within existing Board-designated oil pool boundaries as of 1 August 1981, and exclusive of the area covered by SU Order 800 and other spacing orders, and

(d) that the changes will be effective 1 September 1981 as prescribed in the amending spacing unit order, SU 1088, which will be issued in the next few days.

To facilitate item (c) above, the new spacing unit order will list those pools which the Board considers to be "oil pools".

DATED at Calgary, Alberta,on this 4th day of August, 1981.

ENERGY RESOURCES CONSERVATION BOARD

G J DeSorcy

G. J. DeSorcy, P.Eng.

C. J. Goodman

C. J. Goodman, P.Eng.

N. Strom, P.Eng.

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Alberta Cattle Commission (Cattle Commission) K. Schneider	K. Schneider W. Heller R. Feniak
Alberta Surface Rights Federation (Surface Rights Federation) P. Vasseur	P. Vasseur G. Moulton B. Haddrell
Blindman Valley Farmers Association (Blindman Valley Association) B. Tona	B. Tona
Bluffton Agriculture Association (Bluffton Association) L. Luft	L. Luft A. Goetz
Bonanza and District Surface Rights Association (Bonanza Group) B. Ellingson	B. Ellingson W. Meier
Christian Farmers Federation (Christian Farmers) J. Kolkman	J. Kolkman
County of Beaver No. 9 V. Istace	V. Istace H. Entrup
County of Leduc No. 25, Agricultural Development Committee (County of Leduc No. 25) E. Zotzman	E. Zotzman
Department of Agriculture B. Colgan	
Elk Point Surface Rights Association (Elk Point Association) L. Miller	L. Miller R. Danyluk A. Bugeja G. W. Belke

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report	Witnesses
Farmers' Advocate of Alberta (Farmers' Advocate) H. Entrup	H. Entrup B. Haddrell R. Feniak
Improvement District No. 19, Surface Rights Group (I.D. No. 19) O. Pawluski	O. Pawluski D. Berner E. Socha
Mountainview Landholders Group (Mountainview Group) J. Paton	J. Paton
Municipal District of Bonnyville No. 87 and Improvement District No. 18, Agricultural Development Committee (M.D. of Bonnyville No. 87 and I.D. No. 18) J. Dargis	J. Dargis J. Sarwenski
Municipal District of Sturgeon (M.D. of Sturgeon) G. W. Belke	G. W. Belke
O'Ferrall, B. K.	B. K. O'Ferrall
Parkland Acreage Owners Association L. Proudfoot	L. Proudfoot
Smoky River Surface Rights Society (Smoky River Group) J. D. Carter	A. Briand H. Dion L. Duby D. Champion D. Cote J. Zahara S. Arnadt A. Cloutier G. Gour R. Girard R. Lobercque R. LaPointe C. Penson J. Liland, P.Eng.

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Three Hills Surface Rights Group P. Vasseur	P. Vasseur
Unifarm S. Fisher	I. Weleschuk R. Wilson S. Bell W. McNary, P.Ag.
Warburg-Pembina Surface Rights Group G. Begg	G. Begg
Willow Creek Agricultural Development Committee and Willow Creek Surface Rights Society (Willow Creek Group) E. Nelson	E. Nelson
Amoco Canada Petroleum Company Ltd. (Amoco) J.G.F. McLeod, P.Eng.	J.G.F. McLeod, P.Eng.
Canadian Petroleum Association A. G. Kruse	R. W. Hoover, P.Eng. D. J. Hemphill, P.Eng.
Chevron Standard Limited R. A. Pashelka	
Dome Petroleum Limited (Dome) A. L. McLarty	H. J. Strain, P.Eng. B. Alberts, P.Eng. D. J. Rae T. P. McGlynn J. A. Lore, P.Eng. of McKinnon Allan and Associates
Esso Resources Canada Limited (Esso) R.P.J. Gaetz	H. S. Simpson, P.Eng.

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Hudson's Bay Oil and Gas Company Limited (Hudson's Bay) A. G. Kruse	
Independent Petroleum Association of Canada L. Grimson	
PanCanadian Petroleum Limited (PanCanadian) W. J. Hope-Ross	B. A. Stevens, P.Eng.
Shell Canada Resources Limited (Shell) D. J. Hemphill, P.Eng.	D. J. Hemphill, P.Eng.
Western Mines Limited (Western Mines) J. R. Newbert, P.Eng.	
Energy Resources Conservation Board staff M. J. Bruni	D. G. Pearson, P.Eng. Wm. H. Wolff, P. Eng.

APPENDIX II THOSE WHO MADE A WRITTEN SUBMISSION TO THE BOARD BUT DID NOT APPEAR OR WERE NOT REPRESENTED AT THE HEARING

Alberta Energy and Natural Resources

Alberta Power Limited

Calgary Power Limited

County of Barrhead No. 11 (Agricultural Development Committee)

County of Barrhead No. 11 (Agricultural Service Board)

County of Camrose No. 22

County of Flagstaff No. 29

County of Paintearth No. 18

County of Wetaskiwin No. 10 (Agricultural Development Committee)

Crawford, Graham D. - Smoky Lake, Alberta

East Central Landholders Protective Association

Fairview Surface Rights Group (Municipal District No. 136)

Fischer, Georg W. - Demmitt, Alberta

Lakeland Environmental Agricultural Protection Society

Lamont & District Farmland Protection Association

Red Raven Surface Rights Protective Association

Will Farms Limited - Standard, Alberta

APPENDIX III AGRICULTURE-PETROLEUM-GOVERNMENT COMMITTEE TERMS OF REFERENCE

As indicated in Decision Report 81-4[1], the Board believes that certain current oil field practices and Board regulations should be reviewed to determine whether or not they are appropriate under current conditions. In each case the Board requests the Committee to consider the current practice and related registration and regulations in comparison to the proposed practices, and to evaluate the costs and benefits of the alternatives.

The specific terms of reference are as follows:

1 Should the licensee of a well be required to obtain the agreement of the surface owner respecting the location of production equipment on the well site, and if so, how should it be accomplished?

2 Should the disposal of certain kinds of waste material into pits on the lease be prohibited? If so, what are the practical alternatives for disposal?

3 Should electrical lines to supply oil and gas production operations be buried?

4 Should drilling fluids be contained in tanks on the lease during drilling operations and disposed of off the lease when the drilling is completed?

5 Should the licensee be required to obtain agreement of the surface owner respecting the method of construction of the access road and its location within the right of way? Are innovative construction methods called for?

6 Should the method of vegetation control on the surface lease be modified and how much involvement should the landowner have in this process? Should there be increased inspection of active well sites and are reclamation procedures and certification processes adequate?

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[1] Dome Petroleum Limited, Licences to Drill Wells, Wembley Field, Decision 81-4, 13 March 1981.

APPENDIX III AGRICULTURAL-PETROLEUM-GOVERNMENT COMMITTEE MEMBERSHIP

Alan Frazer Barons	Unifarm
Charles Penson Grand Prairie	Bear Lake Surface Rights Group
Karl Schneider Mannville	Alberta Cattle Commission
Gordon Moulton Hussar	Alberta Surface Rights Federation

PETROLEUM INDUSTRY

Ron Findlay Amoco Canada Petroleum Company Limited	Canadian Petroleum Association
Ed McMaster Shell Canada Resources Limited	Canadian Petroleum Association
John Uibel PanCanadian Petroleum Limited	Independent Petroleum Association of Canada

GOVERNMENT

Brian Colgan Director, Land Use Activities	Alberta Agriculture
Doug Harrington Acting Assistant Deputy Minister Environmental Coordination Services	Alberta Environment
Keith Lyseng Manager, Resource Development & Reclamation	Alberta Energy & Natural Resources
L. A. Bellows, Manager, Development Department	ERCB
E. R. Brushett (Chairman) Manager, Environment Protection Department	ERCB
I. Weleschuck (Secretary) Agriculturalist, Environment Protection Department	ERCB

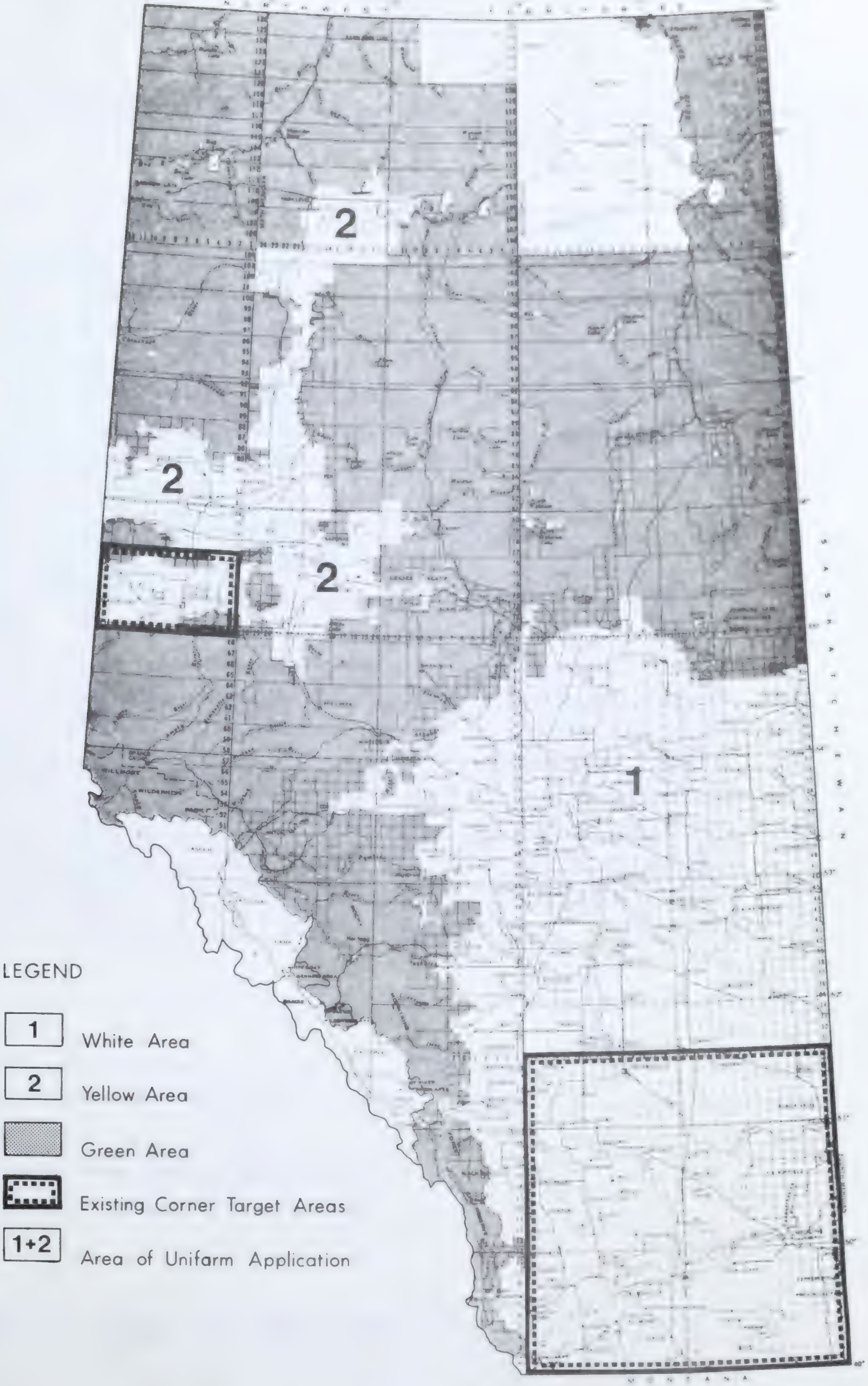
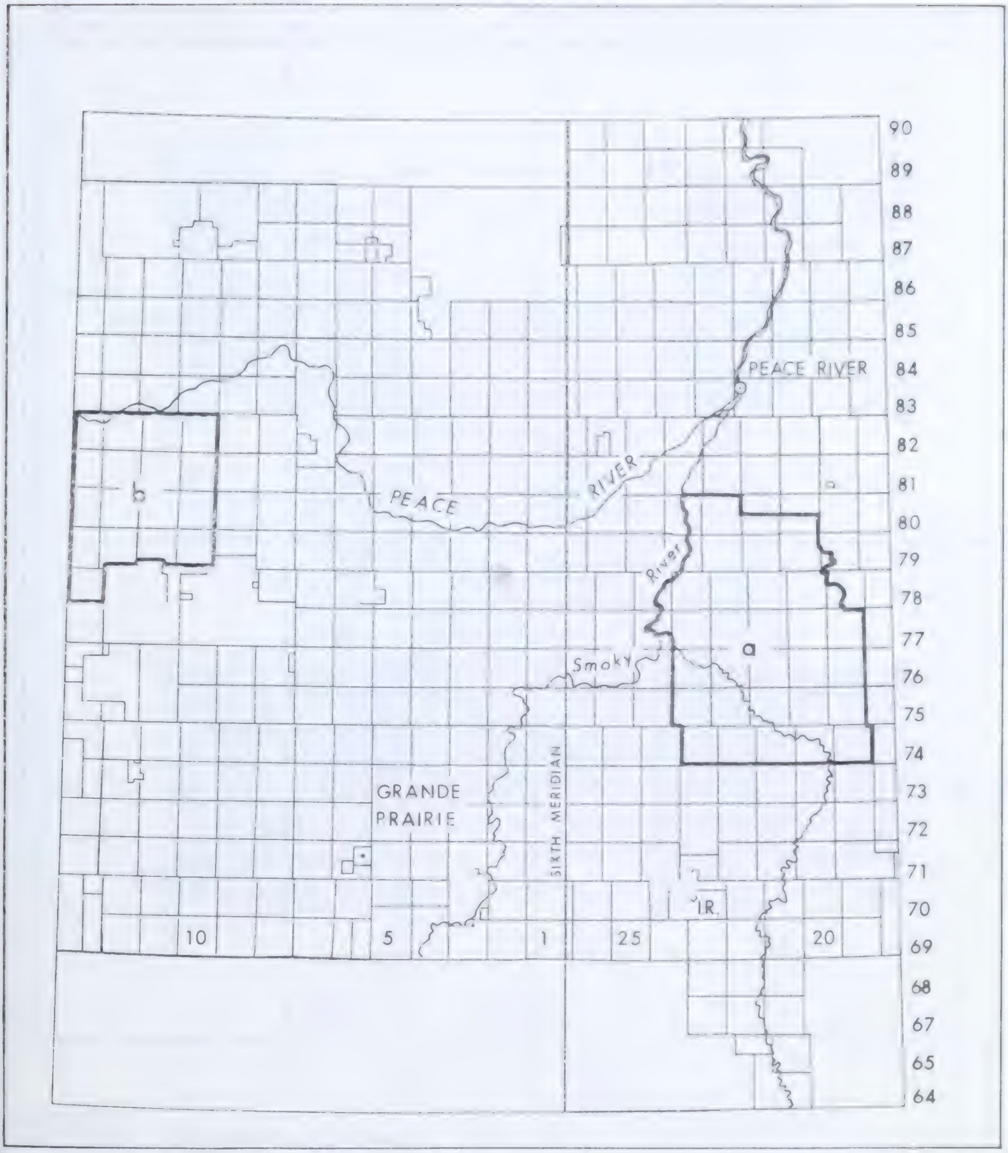


FIGURE 1 AREA OF UNIFARM APPLICATION AND OTHER SIGNIFICANT AREAS



a. Smoky River Surface Rights Society

b. Bonanza and District Surface Rights

FIGURE 2 AREAS OF APPLICATION

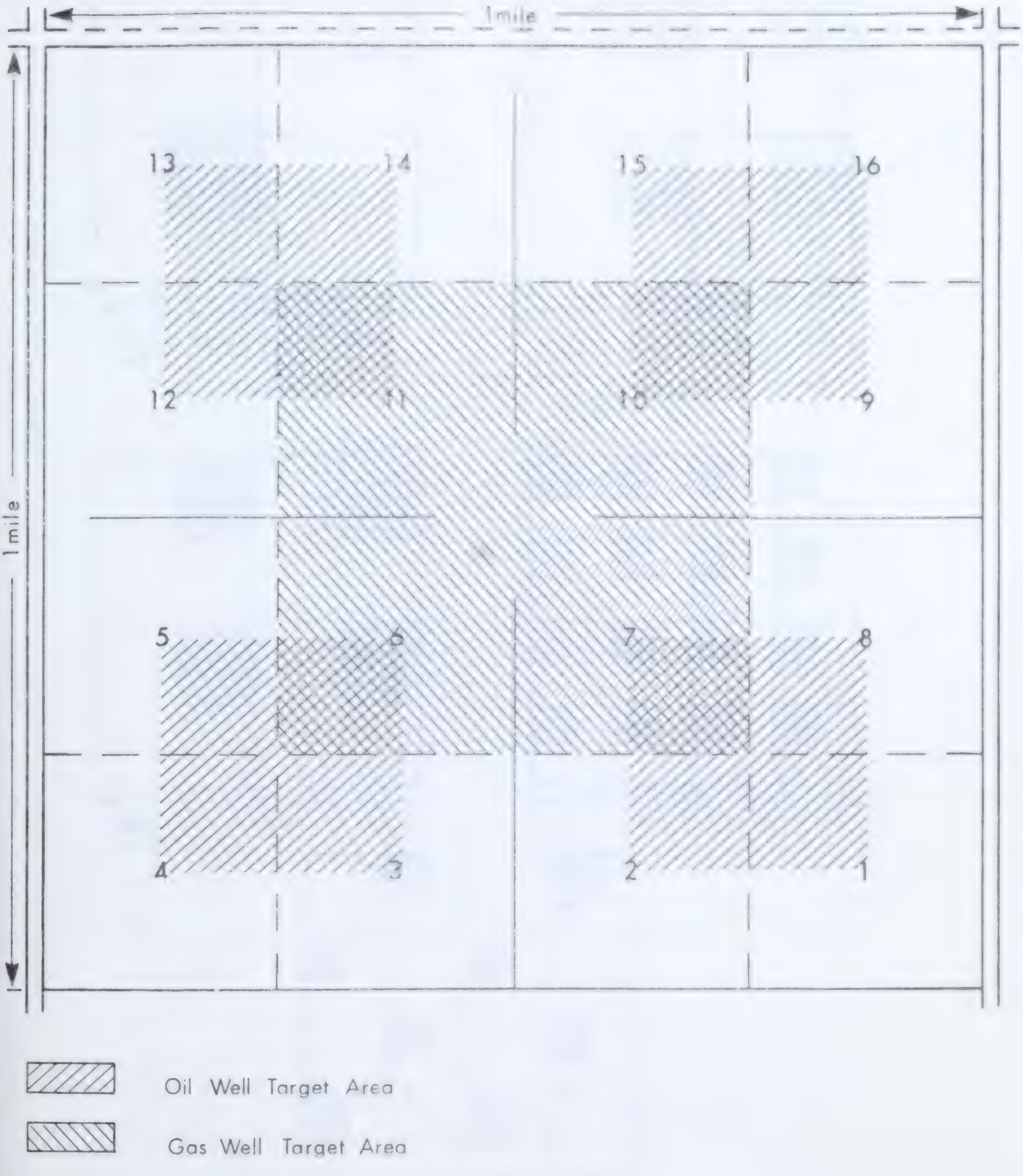
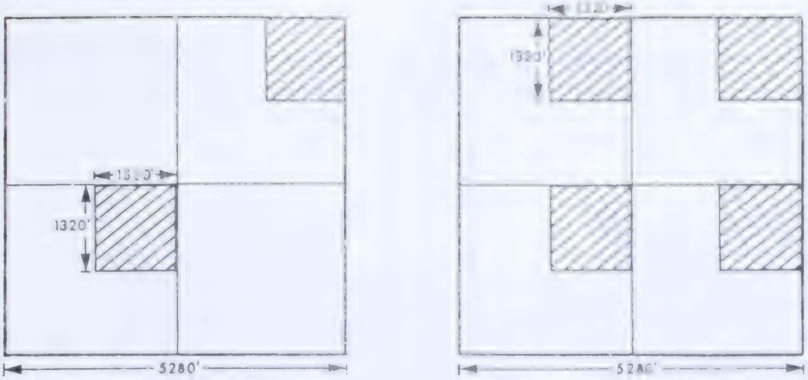


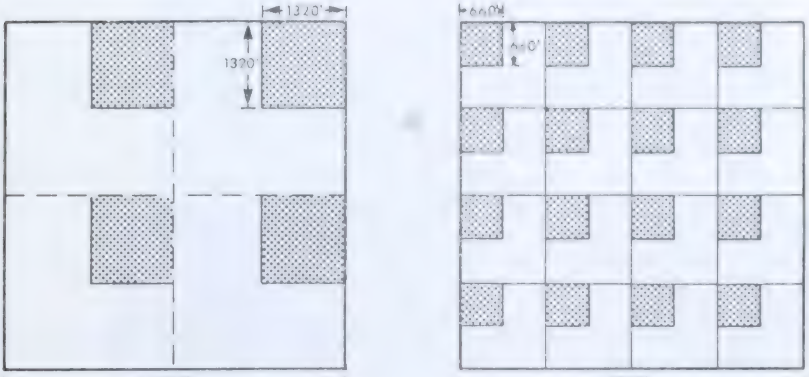
FIGURE 3 CENTRAL TARGET AREAS FOR ONE QUARTER SECTION OIL WELLS AND ONE SECTION GAS WELL - EFFECTIVE JANUARY 1968



A. FOR 1/2 SECTION DRILLING SPACING UNIT

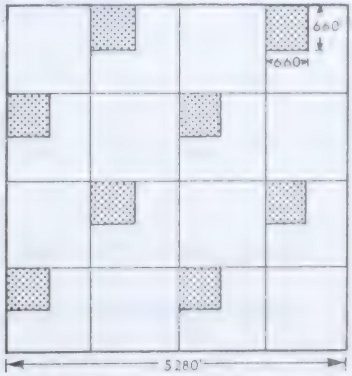
B. FOR 1/4 SECTION DRILLING SPACING UNIT

TARGET AREAS FOR GAS WELLS



A. FOR NORMAL 1/4 SECTION OIL DRILLING SPACING UNITS

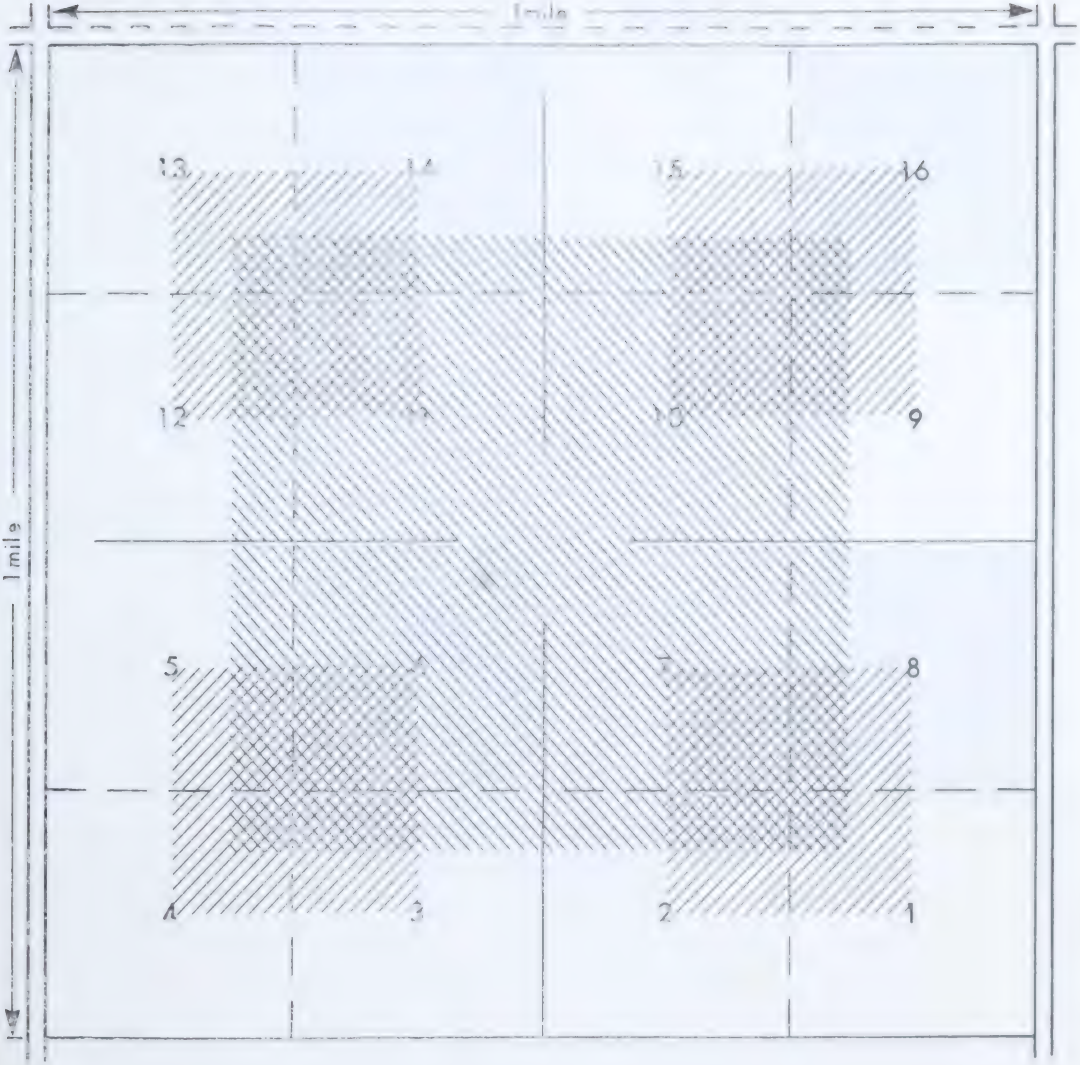
B. FOR 1 LSD OIL DRILLING SPACING UNITS



C. FOR 2 LSD OIL DRILLING SPACING UNITS

TARGET AREAS FOR OIL WELLS

FIGURE 4 TARGET AREAS FOR OIL WELLS AND GAS WELLS OF LESS THAN ONE SECTION SPACING IN AREAS SOUTH OF TOWNSHIP 31 AND EAST OF THE 5th MERIDIAN



▨ Quarter Section Oil Target Areas

▧ One Section Gas Target Area

FIGURE 5 NORMAL DRILLING SPACING UNIT TARGET AREAS

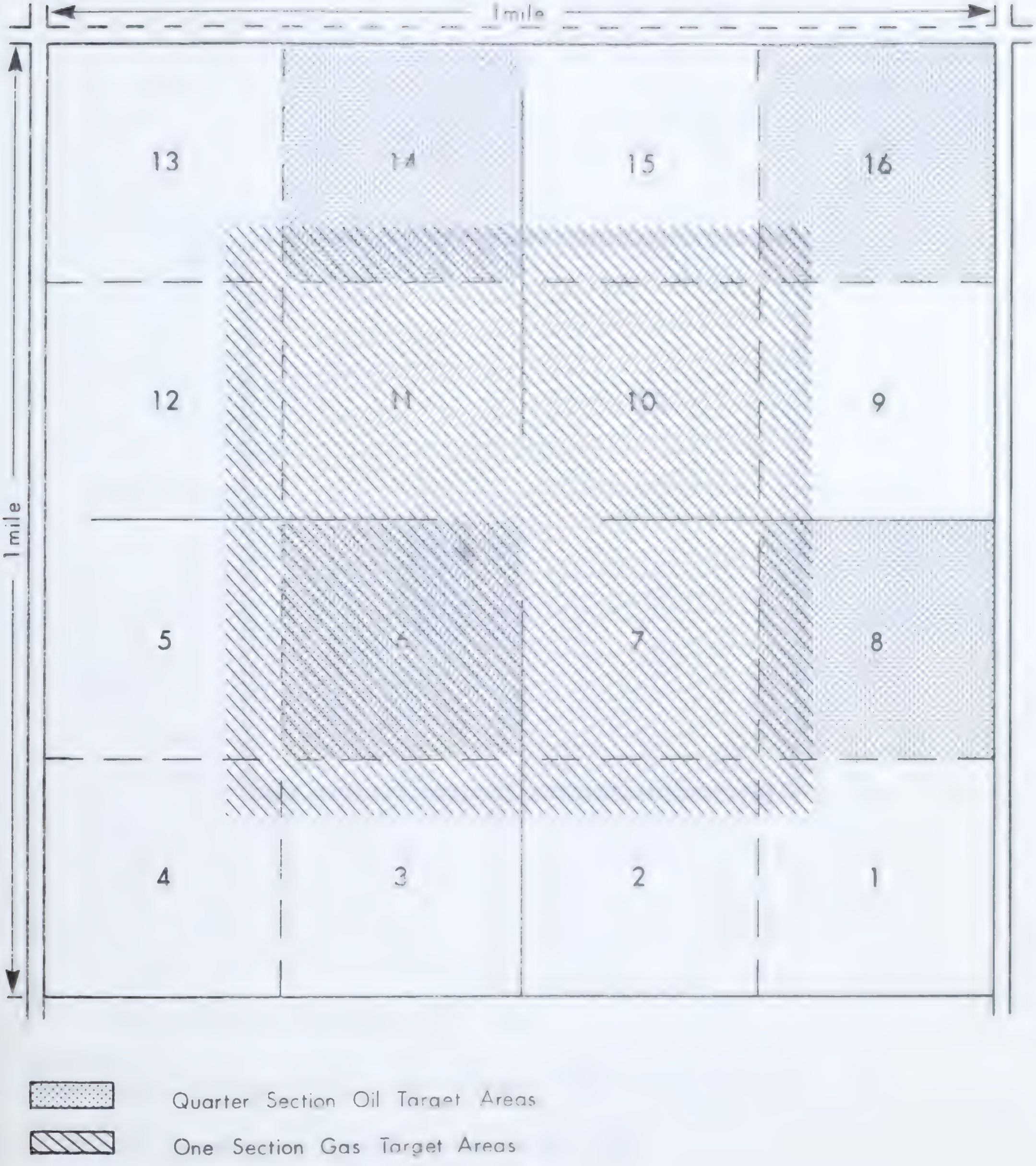
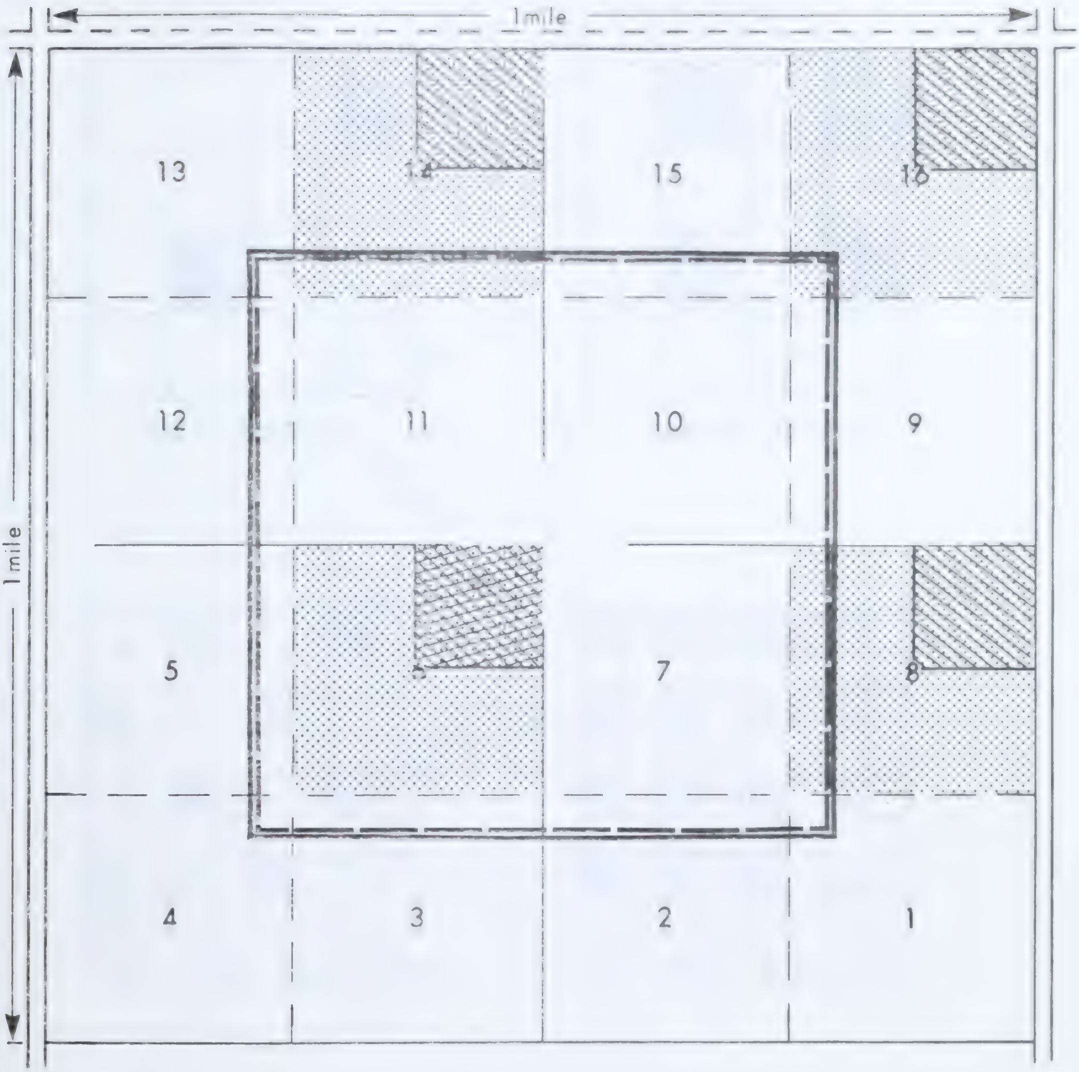

1mile
1 mile
13
14
15
16
12
11
10
9
5
6
7
8
4
3
2
1
Quarter Section Oil Target Areas
One Section Gas Target Areas

FIGURE 6 DRILLING SPACING UNIT TARGET AREAS
SOUTHEASTERN ALBERTA



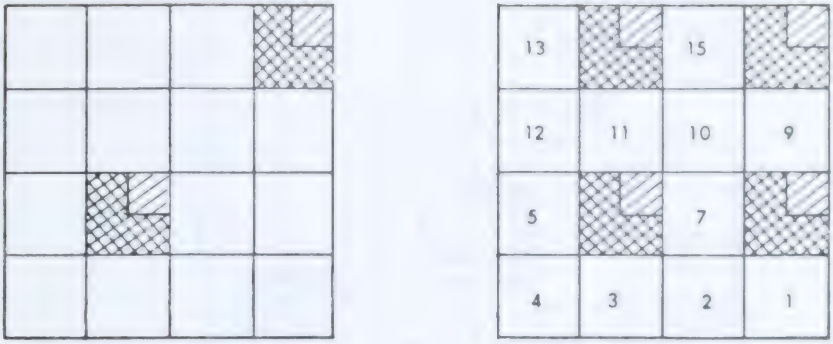
▒ Oil Target Area - One Quarter Section Spacing

▧ Primary One Quarter Section Target Areas

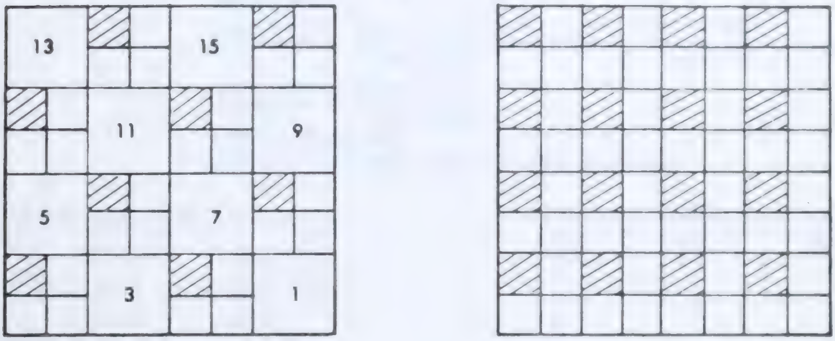
▩ Primary One Section Target Area

═ Gas Target Area - One Section Spacing

FIGURE 7 TARGET AREAS - GRANDE PRAIRIE AREA



HALF SECTION QUARTER SECTION



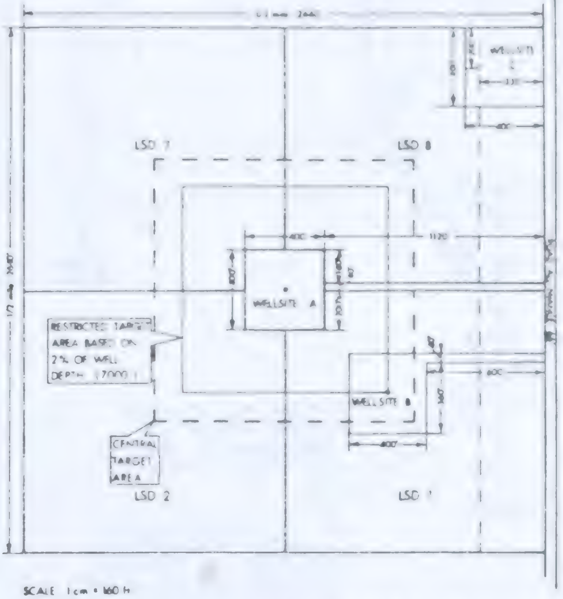
TWO LEGAL SUBDIVISION ONE LEGAL SUBDIVISION

TARGET AREA

▨ Primary

▩ Secondary

FIGURE 8 DRILLING SPACING UNIT TARGET AREAS FOR OIL WELLS OF VARIOUS SPACING – GRANDE PRAIRIE AREA



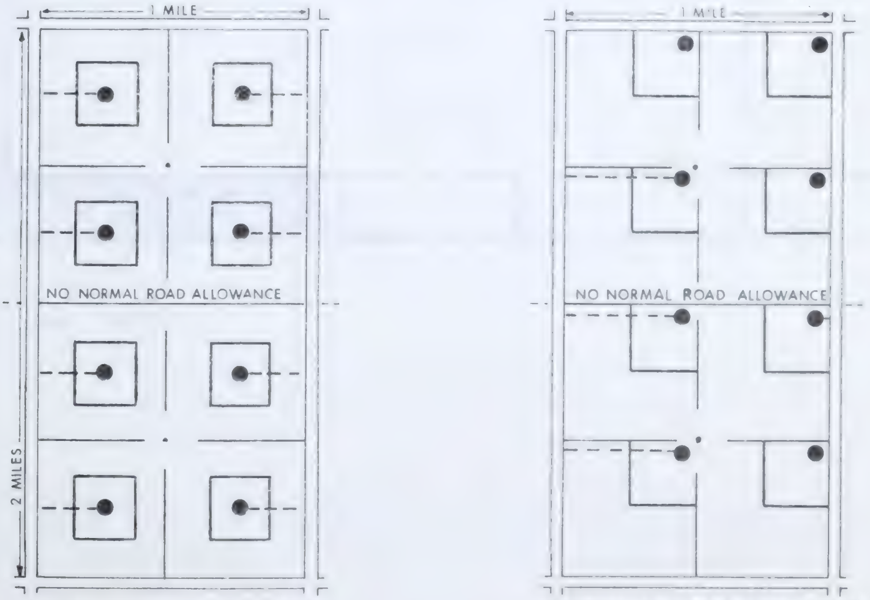
SCALE 1cm = 160 ft

ACREAGE WELLSITE A 400 × 400 = 3.67 ACRES
ACREAGE ROADWAY A 1120' × 40' = 1.03 ACRES
TOTAL = 4.70 ACRES

ACREAGE WELLSITE C 400 × 400 = 3.67 ACRES
ACREAGE ROADWAY C 0' × 40' = [illegible] ACRES
TOTAL = 3.67 ACRES

ACREAGE WELLSITE B 400' × 400' = 3.67 ACRES
ACREAGE ROADSIDE B 600' × 40' = 0.55 ACRES
TOTAL = 4.22 ACRES

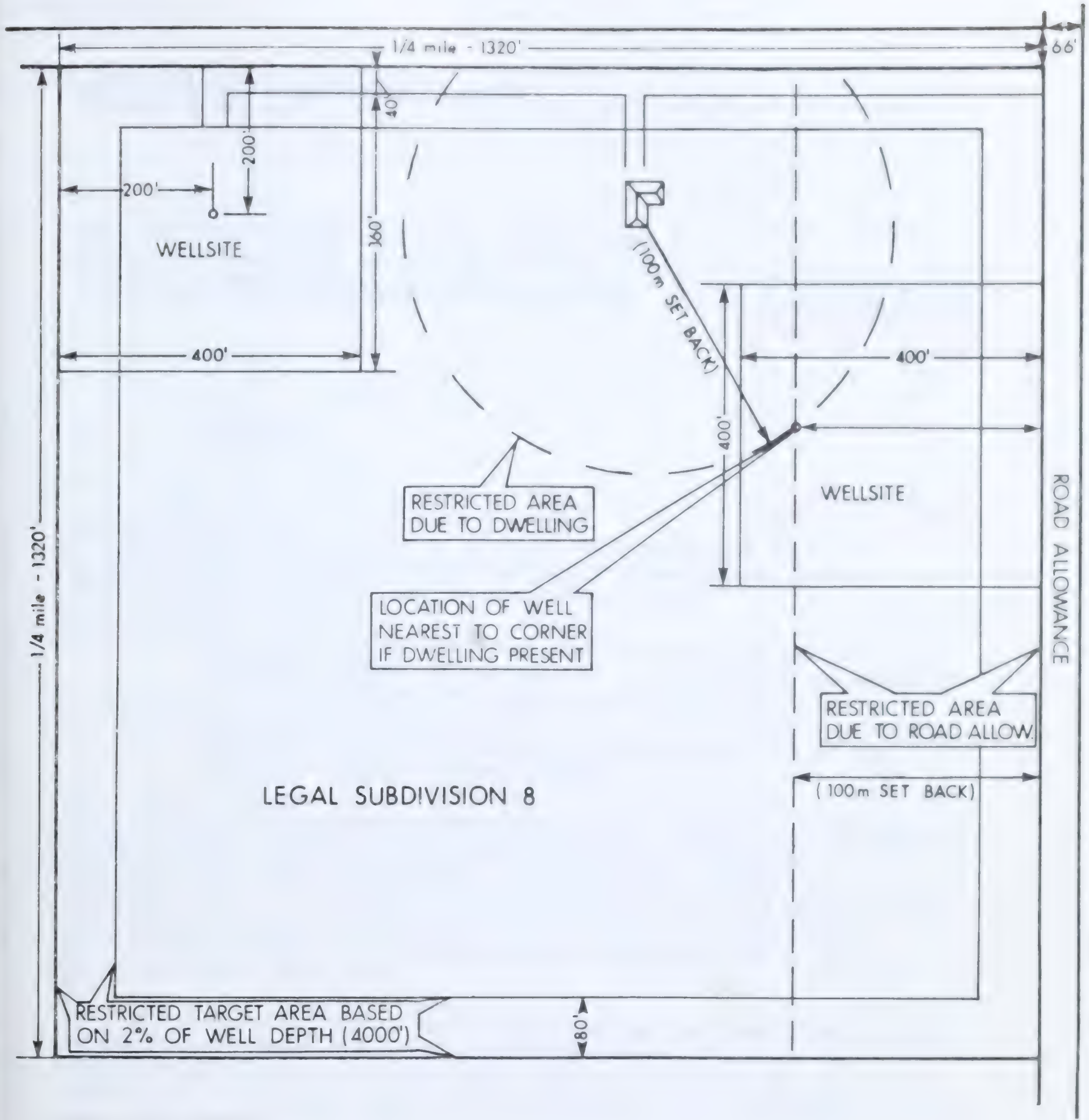
ACREAGE REQUIREMENT
QUARTER SECTION WELLSITE AND ROADWAY



ROADWAY 1/4 SECTION SPACING CENTRAL TARGETS

ROADWAY 1/4 SECTION SPACING OFFSET TARGETS

FIGURE 9 WELLSITE AND ROADWAY ACREAGE QUARTER SECTION SPACING


1/4 mile - 1320'
66'
1/4 mile - 1320'
40'
200'
200'
WELLSITE
360'
400'
(100m SET BACK)
400'
400'
WELLSITE
ROAD ALLOWANCE
RESTRICTED AREA DUE TO DWELLING
LOCATION OF WELL NEAREST TO CORNER IF DWELLING PRESENT
RESTRICTED AREA DUE TO ROAD ALLOW.
(100m SET BACK)
LEGAL SUBDIVISION 8
RESTRICTED TARGET AREA BASED ON 2% OF WELL DEPTH (4000')
80'

SCALE 1 cm = 160 ft

FIGURE 10 WELLSITE AND ROADWAY ACREAGE QUARTER SECTION SPACING OFF SET TARGET AREA

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

DRILLING SPACING UNIT TARGET-AREA REQUIREMENTS FOR OIL AND GAS WELLS DRILLED IN THE MUNICIPAL DISTRICT OF SMOKY RIVER AND THE BONANZA AREA

Decision 81-21
Proceeding 810078

UNIVERSITY OF ALBERTA
AUG - 7 1981
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1 INTRODUCTION

1.1 The Applications

The Smoky River Surface Rights Society and Bonanza and Districts Surface Rights Association submitted applications to the Energy Resources Conservation Board (the Board) to have:

- the target areas for quarter-section spacing shifted to the northeast corner of the quarter section similar to Board Order SU 1040 in the Grande Prairie area, and

- the target area for one-section spacing shifted to the northeast corner of the section.

Upon receipt of these applications, and notice that Unifarm and other surface rights associations were preparing similar applications, the Board called a public hearing for the purpose of receiving representations concerning the target areas for drilling spacing units of oil and gas wells in the province as a whole, as well as the specific areas identified as the Municipal District (M.D.) of Smoky River and the Bonanza area.

This report deals only with the applications of the farm rights groups in the M.D. of Smoky River and the Bonanza area. The Board has addressed the issue of establishing corner target areas for the entire province in a separate report, Decision 81-20, which is being released concurrently with this report.

The areas under consideration in this report as well as the area in which Board Order SU 1040 applies, are shown in Figure 1.

1.2 The Hearing

The hearing was held in Edmonton on 16 March to 20 March 1981 with G. J. DeSorcy, P.Eng., C. J. Goodman, P.Eng., and N. Strom, P.Eng., sitting.

Appendix I lists those who appeared at the hearing and Appendix II lists those who made written submissions to the Board but did not appear or were not represented at the hearing. Since the matter of spacing for the province as a whole was considered at the same hearing, it should be noted that many of the parties listed in Appendices I and II did not make representations respecting the specific area applications.

1.3 Preliminary Matter

At the outset, Amoco submitted a motion to adjourn the hearing in order to provide sufficient time for it to analyze the submissions of the farm groups and to adequately prepare its evidence. It stated that additional time was needed because the concept of changing target areas in existing oil and gas pools is a complex issue involving conservation, correlative rights, and equity, and that future development of existing pools and the development of other horizons deeper or shallower than existing pools must also be taken into account. As an alternative, if the Board were to proceed with the hearing, Amoco suggested that the hearing should be held in two parts; the first part dealing with the submissions of the agricultural groups and the second part dealing with the oil industry submissions and which could be held at a later date.

Amoco's motion was supported by Chevron Standard Limited, Canadian Petroleum Association, and PanCanadian Petroleum Limited, while the agricultural groups were opposed to any adjournment.

The Board considered the matter and decided not to grant the request for an adjournment because it was satisfied that sufficient notice of hearing had been given, especially when considering the degree to which the matter has been investigated in the past, particularly over the last few years.

1.4 Background

The history of spacing changes in Alberta is discussed in detail in Decision 81-20, which deals with target-area changes for the province as a whole, and is not included in this report.

2 THE ISSUES

Decision 81-20 (being released concurrently with this report) on the subject of target areas for the province as a whole has indicated a Board decision as follows:

- that the target area for drilling spacing units of less than one section should, like that for the Grande Prairie area, be changed to provide for target-area orientation and primary and secondary target areas as described in Figures 2 and 3,

- that the target area for one-section spacing should remain in the centre of the section and should have a primary target area as shown in Figure 2,
- that the changes will be effective for all white and yellow areas of Alberta, exclusive of lands within existing Board-designated oil pools as of 1 August 1981, and exclusive of the area covered by Board Order SU 800 and other spacing orders, and
- that the changes will be effective 1 September 1981 as prescribed in the amending spacing unit order SU 1088 which will be issued in the next few days.

Given the above decision for the province as a whole, the Board believes the only issue relevant to these area-specific applications is whether special circumstances exist within the areas such that the province-wide decision should not apply or should apply but in a somewhat varied form. Notwithstanding that the Board will present its views only with respect to the above-mentioned issue, it will summarize the views of participants in the hearing as they relate to the following:

- the advantages and disadvantages of changing the drilling-spacing-unit (DSU) target areas in the M.D. of Smoky River and the Bonanza area, and
- if there is merit in a change,
  - (i) the changes that should be adopted, and
  - (ii) the timing of implementation.

3 THE ADVANTAGES AND DISADVANTAGES OF CHANGING THE DSU TARGET AREAS

3.1 Views of the Smoky River Group

The Smoky River group contended that the current target-area regulations result in substantial inconvenience to the agricultural industry. It submitted that the additional turns required to operate around a central well site would cause compaction of the soil if wet or would pulverize the soil if dry, would result in uneven applications of fertilizers and chemicals for weed control, uneven seeding, and would cause additional strain on equipment. In addition, it stated that agricultural production is reduced because of wells being located in the centre of cultivated fields. The Smoky River group emphasized that time is a critical factor in the farming operations in its area due to adverse climatic conditions, and it contended that locating wells in the centre of fields goes against the normal tendency of farmers to try to remove all obstacles from their fields so as to accommodate larger machinery and thereby reduce the time requirements of their farming operations. In addition, the Smoky River group stated that surface drainage is also of critical concern in its area. It submitted that construction of access roads can interfere with drainage and further, that petroleum industry activities such as road building, mixing topsoil and subsoil, using gravel on roads and moving heavy equipment, especially when the soil is wet, can result in permanent damage to the soil. Hence, it concluded that adoption of corner target areas would minimize these detrimental impacts on farming.

The Smoky River group submitted that setback requirements of the Board and of municipalities and electrical utilities preclude well sites being placed directly in the corner. However, it stated that it was preferable to have the wells as close as possible to the corners rather than in the centre of the fields. It suggested that where a municipality has a smaller setback requirement than the Board, the Board should reconsider the setback requirements in order to provide additional flexibility to both the mineral owner and the surface owner.

3.2 Views of the Bonanza Group

The Bonanza group, like the Smoky River Group, advocated a shift in target area to the northeast corner for both one-section and quarter-section spacing. The Bonanza group expressed concerns very similar to those of the Smoky River group regarding inconvenience and additional costs to farming operations and loss of agricultural land caused by the current regulations. In addition, it stressed that drainage of surface water was a major problem in its area and that this problem was compounded by constructing access roads into the centres of the quarter sections and by stockpiling topsoil.

3.3 Views of Other Agricultural Groups

None of the other agricultural groups commented specifically on the M.D. of Smoky River or the Bonanza area. However, they all favoured corner target areas and hence by inference supported the applications by the Smoky River and Bonanza groups.

3.4 Views of the Petroleum Industry

Dome was opposed to any change in target areas in the M.D. of Smoky River or the Bonanaza area as well as the remainder of the province, and was particularly concerned that a shift in target areas might have an adverse affect on a waterflood scheme that is now planned for the Bonanza Boundary A Pool (Bonanza pool). It submitted that adopting SU 1040-type target areas in the Bonanza pool at this stage of pool development, and assuming no future change in well density, would result in a skewed drainage pattern. Dome submitted that its preliminary calculations, which assume no future infill drilling, indicated a potential conservation loss of at least 250 000 barrels (bbl)[40 000 cubic metres(m^3)] of recoverable oil because there would not be a uniform sweep from the injection well to the producing wells due to this skewed pattern.

In addition, Dome carried out a simple computer simulation to test the sensitivity of pattern sweep efficiency versus the distance the injection well was moved off target. Dome concluded that pattern sweep efficiency could be reduced by as much as 10 per cent by moving the injector half-way to one side and by as much as 20 per cent if it were moved completely to one side of the pattern. However, it acknowledged that when applied to an actual pool, the losses would not be as large because wells are not always drilled in the centres of target areas and because there are always incomplete patterns around the edges of a pool.

Dome expressed concern that under SU 1040 spacing, the delays in obtaining well site locations in general, and in particular, the need to divulge confidential information to support a location in the secondary target area allows competitors to gain valuable confidential information, restricts the opportunity to drill wells in order to gain information for periodic crown land sales, and often results in severe penalties when contractual and exploration commitments cannot be met. A further concern was that, under SU 1040 spacing, the provincial drilling incentive system would become less effective because qualifying for incentives would not be a valid reason for moving from the primary to the secondary target area.

PanCanadian, which also owns land in the Bonanza pool, stated that existing target areas should be maintained in the Bonanza area. It agreed with Dome that mixing SU 1040 target areas with central target areas in an existing oil pool would be detrimental to oil recovery. It used the Wembley oil pool, located in the Grande Prairie area where the orientation of target areas was changed when the pool was being developed, resulting in mixed target areas within this pool, in its analysis of effect on recovery. Based on its initial reservoir studies, which assume no future infill drilling, PanCanadian contended that a conservation loss in the order of 600 000 bbl (95 000 m^3) of recoverable oil could occur in the pool as a whole and in the order of 400 000 bbl (64 000 m^3) of recoverable oil from PanCanadian's acreage due to mixing target areas.

Other representatives of the petroleum industry were opposed to corner target areas for the same reasons. They were of the opinion that the present central target areas offered the most flexibility because the large common target area allowed the locating of wells to take optimum advantage of subsurface geological occurrences as well as any land surface obstructions to reduce the impact on farming.

A number of the petroleum industry participants argued that SU 1040-type target-area provisions would considerably reduce such flexibility, especially when setback requirements were taken into account. Also, these setback requirements would tend to negate any desirable benefits resulting from a target-area shift by tending to move wells away from the corners and back into the fields. Corner locations would be less likely to be utilized by a farmer due to the difficulties of working farm equipment between well facilities and boundary lines, whereas for leases located in the centre of fields, such difficulties do not occur.

4 DESIRABLE CHANGES TO SUBSISTING TARGET-AREA PROVISIONS

4.1 Views of the Smoky River Group

The Smoky River group stated that the M.D. of Smoky River is very similar to the Grande Prairie area in many respects. It is characterized by large, wide-open farms, surface drainage is of critical concern, time is a critical factor in farming operations because of adverse climatic conditions, and most importantly, there has been little drilling activity to date. Hence, the Smoky River group concluded that the same reasons which the Board found for changing target areas in the Grande Prairie area applied equally if not to a greater extent in the M.D. of Smoky River. Therefore, it submitted that the northeast target area for quarter-section DSUs with a primary and secondary configuration adopted for the Grande Prairie area (SU 1040), should be adopted for the M.D. of Smoky River. As an extension of this concept, the Smoky River group requested that the one-section gas target area be shifted to the northeast corner of the section and that the primary one-section target area be moved from the northeast corner of Lsd 6 (as is used in the Grande Prairie area) to the northeast corner of Lsd 16, as shown in Figure 4. The Smoky River group indicated that its request for a change in target area applied only to agricultural areas and not to the green area.

The Smoky River group submitted that where it was necessary to locate wells towards the centre of fields in the secondary target area, wells should be located to take advantage of natural obstructions on the land. It contended that the wishes of the landowners should receive appropriate consideration by the petroleum industry in determining the location of the well site and the route of the access road. It stated that special situations might occur where the proposed target areas would be unacceptable to either the oil company or the farmer and that in such cases, the location of a well could be moved upon a mutual agreement between the oil company and the farmer, or following a Board hearing. It was prepared to accept the Board's assessment as to whether a location away from the corner of a DSU or property boundary was desirable.

4.2 Views of the Bonanza Group

The proposals and views of the Bonanza group were identical to those of the Smoky River group. With respect to whether SU 1040 spacing should be adopted in the Bonanza oil pool, it said that it would leave that decision to the Board.

4.3 Views of Other Agricultural Groups

The other agricultural groups generally supported the shift to corner target areas for one-section and quarter-section spacing that were proposed by the Smoky River and Bonanza groups, and agreed that changes need apply only to agricultural areas.

4.4 Views of the Petroleum Industry

Although not thoroughly convinced that shifting target areas to the northeast corner would solve all the problems expressed by the agricultural community, Esso recommended that corner target areas now in effect under SU 1040 be adopted in the M.D. of Smoky River and the Bonanza area, as well as the remainder of the province, with the exception of the green area, the area of Board Order SU 800, and already developed pools. Esso recognized that cooperation and compromise are essential for achieving a workable scheme. It stated that any new regulations should allow for flexibility of location of target areas where local conditions necessitate variations.

As stated earlier in section 3.4, Dome and PanCanadian were opposed to any changes in target areas in the Bonanza area. Dome was also opposed to any changes in the M.D. of Smoky River. Dome stated that if the Board saw fit to make target-area changes, then such changes should be similar to SU 800 which allows a more reasonable degree of flexibility for the industry than SU 1040.

Both Shell and Amoco did not comment specifically on the M.D. of Smoky River or the Bonanza area, but Shell accepted that northeast target areas for half-section spacing and smaller are practical in agricultural areas. Both recommended that implementation should be by individual application on a specific area basis. The other representatives of the petroleum industry were of the opinion that further revisions to the present target areas were not warranted.

The industry was unanimous that no changes should be made to spacing in the green area or in already developed areas. Several companies submitted that the Board should provide buffer zones around already developed oil and gas fields to protect equity and ensure conservation.

5 IMPLEMENTATION OF THE REVISED TARGET AREAS

5.1 Views of the Smoky River and Bonanza Groups

Both groups contended that to minimize the impact of future drilling on agricultural operations, any new target-area orientation should be implemented as quickly as possible.

5.2 Views of the Petroleum Industry

Petroleum industry representatives, except Esso, generally contended that before the Board made any changes, the "Grande Prairie experiment"

(SU 1040) should be studied to assess the effects and ramifications resulting from this target-area orientation. They indicated that at least another year would be required to do this. Esso proposed adoption of target-area provisions similar to those of SU 1040.

6 VIEWS OF THE BOARD

The Board has presented its detailed views respecting the implementation of corner target areas for the province as a whole in Decision 81-20, being released concurrently with this decision report. In Decision 81-20, the Board has decided to adopt the target areas now in use in the Grande Prairie area for much of the remainder of the province. The target areas being adopted are illustrated in Figures 2 and 3. In this section, the Board is addressing the question of whether the province-wide decision, precisely as described in Decision 81-20, should apply to the M.D of Smoky River and the Bonanza area or whether other changes should be made.

The Board is of the view that the M.D. of Smoky River and the Bonanza area are agriculturally developed areas where the general concept of corner target areas should be adopted. It thus believes its decision respecting corner target areas for DSUs of less than one section should apply. However, as is the case elsewhere in the province, the Board sees little advantage in adopting corner target areas for the normal gas DSU of one section, and accordingly, denies that portion of the Smoky River and Bonanza applications.

The Board notes that the Smoky River and Bonanza groups agreed that any changes to target areas need apply only to the white and yellow areas, rather than the green areas in general. Thus, the Board will exclude most green areas in the areas of application from Board order SU 1088 which is being issued, as a result of Decision 81-20, shifting the target areas for the province as a whole.

The Board indicated in Decision 81-20 that it is also excluding from the area for which shifted target areas will be applied, lands within oil pools as designated on 1 August 1981. The Board has reviewed the M.D. of Smoky River and the Bonanza area to determine whether there are any pools in these areas where this general provision should be altered. The Board believes that the only pool in the area which requires careful consideration for exception from the newly-adopted province-wide rule is the Bonanza oil pool. The Dome evidence, discussed earlier in this report, indicated that development of the Bonanza oil pool is continuing. The Board notes that the Bonanza pool is fairly well developed with only 9 of a possible 31 locations yet to be drilled. In addition, the Board has reviewed the Bonanza pool in detail and believes that Dome's estimate that the ultimate recovery of reserves could be reduced by some 250 000 bbl (40 000 m^3) of oil if target areas were shifted at this stage of development, is reasonable. Therefore, the Board is of the view that the province-wide rule, of excluding from target-area changes, lands within oil-pool boundaries as of 1 August 1981, should apply to the M.D. of Smoky River and the

Bonanza area. The situation respecting the Bonanza pool is also discussed in Decision 81-20. The Board notes, as is stated in Decision 81-20, that in special situations, it will consider applications for changes to this general rule from either the petroleum industry or the agricultural community, based on the existing circumstances.

As is the case for the province as a whole, the target-area changes referred to in this report will be effective 1 September 1981, which is the effective date of Board Order SU 1088 which will be issued in the next few days.

7 DECISION

The Board is including the M.D. of Smoky River and the Bonanza area in Board Order SU 1088 which is being issued to shift target areas for much of the province.

DATED at Calgary, Alberta on this 4th day of August 1981.
ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy
G. J. DeSorcy
Vice Chairman

C. J. Goodman
C. J. Goodman
Board Member

N. Strom
Board Member

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnessess
Smoky River Surface Rights Society (Smoky River Group) J. D. Carter	A. Briand H. Dion L. Duby D. Champion D. Cote J. Zahara S. Arndt A. Cloutier G. Gour R. Girard R. Labrecque R. LaPointe C. Penson J. Liland, P.Eng.
Bonanza and Districts Surface Rights Association (Bonanza Group) B. Ellingson	B. Ellingson W. Meier
Alberta Cattle Commission K. Schneider	K. Schneider W. Heller R. Feniak
Alberta Surface Rights Federation P. Vasseur	P. Vasseur G. Moulton B. Haddrell
Blindman Valley Farmers Association B. Tona	B. Tona
Bluffton Agriculture Association L. Luft	L. Luft A. Goetz
Christian Farmers Federation J. Kolkman	J. Kolkman
County of Beaver No. 9 V. Istace	V. Istace H. Entrup
County of Leduc No. 25, Agricultural Development Committee E. Zotzman	E. Zotzman
Department of Agriculture B. Colgan	

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Elk Point Surface Rights Association L. Miller	L. Miller R. Danyluk A. Bugeja G. W. Belke
Farmers' Advocate of Alberta H. Entrup	H. Entrup B. Haddrell R. Feniak
Improvement District No. 19, Surface Rights Group O. Pawluski	O. Pawluski D. Berner E. Socha
Mountainview Landholders Group J. Paton	J. Paton
Municipal District of Bonnyville No. 87 and Improvement District No. 18, Agricultural Development Committee J. Dargis	J. Dargis J. Sarwenski
Municipal District of Sturgeon G. W. Belke	G. W. Belke
O'Ferrall, Brian K.	B. K. O'Ferrall
Parkland Acreage Owners Association L. Proudfoot	L. Proudfoot
Three Hills Surface Rights Group P. Vasseur	P. Vasseur
Unifarm S. Fisher	I. Weleschuk R. Wilson S. Bell W. McNary, P.Ag.
Warburg-Pembina Surface Rights Group G. Begg	G. Begg
Willow Creek Agricultural Development Committee and Willow Creek Surface Rights Society E. Nelson	E. Nelson
Amoco Canada Petroleum Company Ltd. (Amoco) J.G.F. McLeod, P.Eng.	J.G.F. McLeod, P.Eng.

APPENDIX I THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Canadian Petroleum Association A. G. Kruse	R. W. Hoover, P.Eng. D. J. Hemphill, P.Eng.
Chevron Standard Limited R. A. Pashelka	
Dome Petroleum Limited (Dome) A. L. McLarty	H. J. Strain, P.Eng. B. Alberts, P.Eng. D. J. Rae T. P. McGlynn J. A. Lore, P. Ag. of McKinnon Allan and Associates
Esso Resource Canada Limited (Esso) R.P.J. Gaetz	H. S. Simpson, P.Eng.
Hudson's Bay Oil and Gas Company Limited A. G. Kruse	
Independent Petroleum Association of Canada L. Grimson	
PanCanadian Petroleum Limited (PanCanadian) W. J. Hope-Ross	B. A. Stevens, P.Eng.
Shell Canada Resources Limited (Shell) D. J. Hemphill, P.Eng.	D. J. Hemphill, P.Eng.
Western Mines Limited J. R. Newbert, P.Eng.	
Energy Resources Conservation Board Staff M. J. Bruni	D. G. Pearson, P.Eng. Wm. H. Wolff, P.Eng.

APPENDIX II THOSE WHO MADE A WRITTEN SUBMISSION TO THE BOARD BUT DID NOT APPEAR OR WERE NOT REPRESENTED AT THE HEARING

Alberta Energy and Natural Resources

Alberta Power Limited

Calgary Power Limited

County of Barrhead No. 11 (Agricultural Development Committee)

County of Barrhead No. 11 (Agricultural Service Board)

County of Camrose No. 22

County of Flagstaff No. 29

County of Paintearth No. 18

County of Wetaskiwin No. 10 (Agricultural Development Committee)

Crawford, Graham D. - Smoky Lake, Alberta

East Central Landholders Protective Association

Fairview Surface Rights Group (Municipal District No. 136)

Fischer, Georg W. - Demmitt, Alberta

Lakeland Environmental Agricultural Protection Society

Lamont & District Farmland Protection Association

Red Raven Surface Rights Protective Association

Will Farms Limited - Standard, Alberta

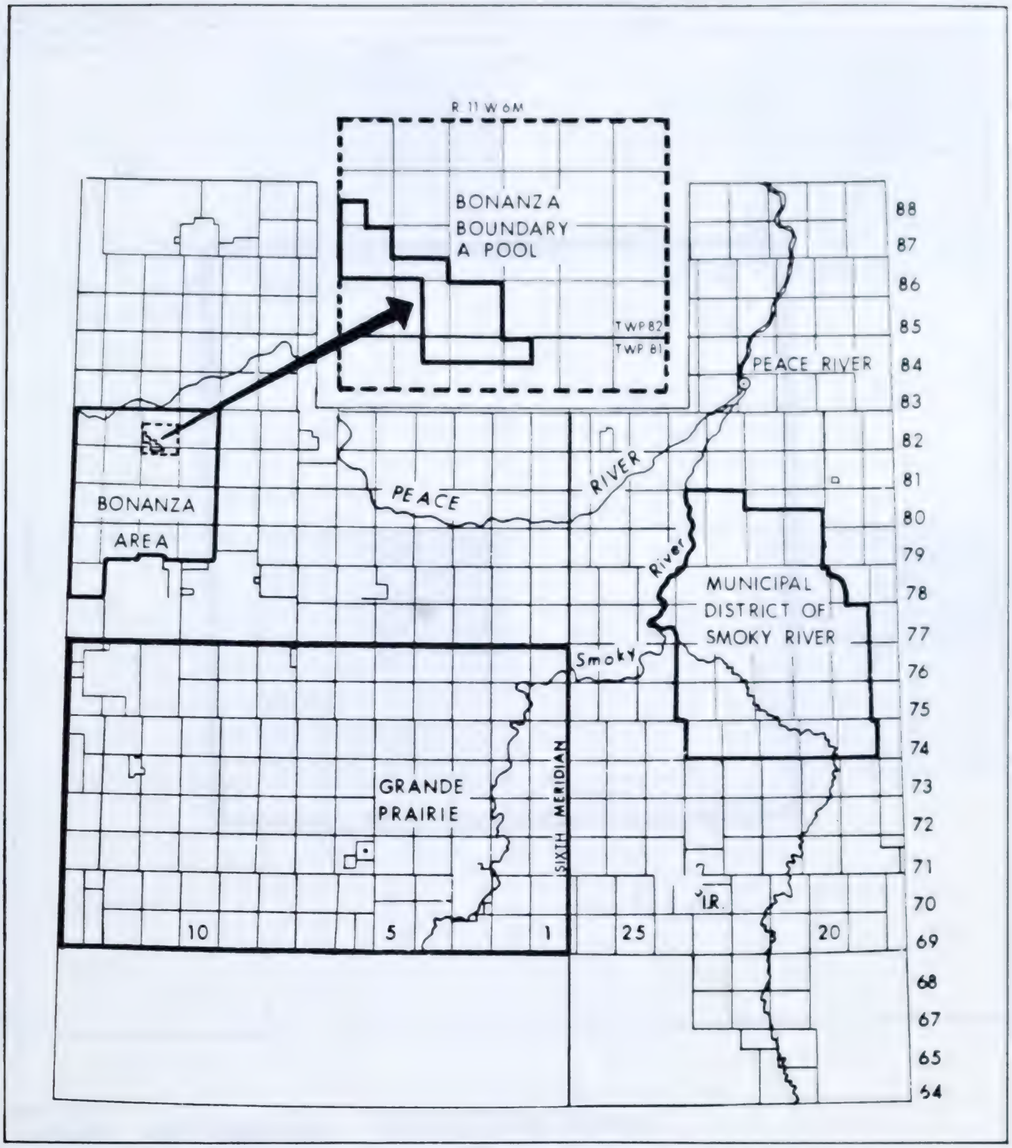


FIGURE 1 GRANDE PRAIRIE AREA AND AREA UNDER CONSIDERATION

[illegible]

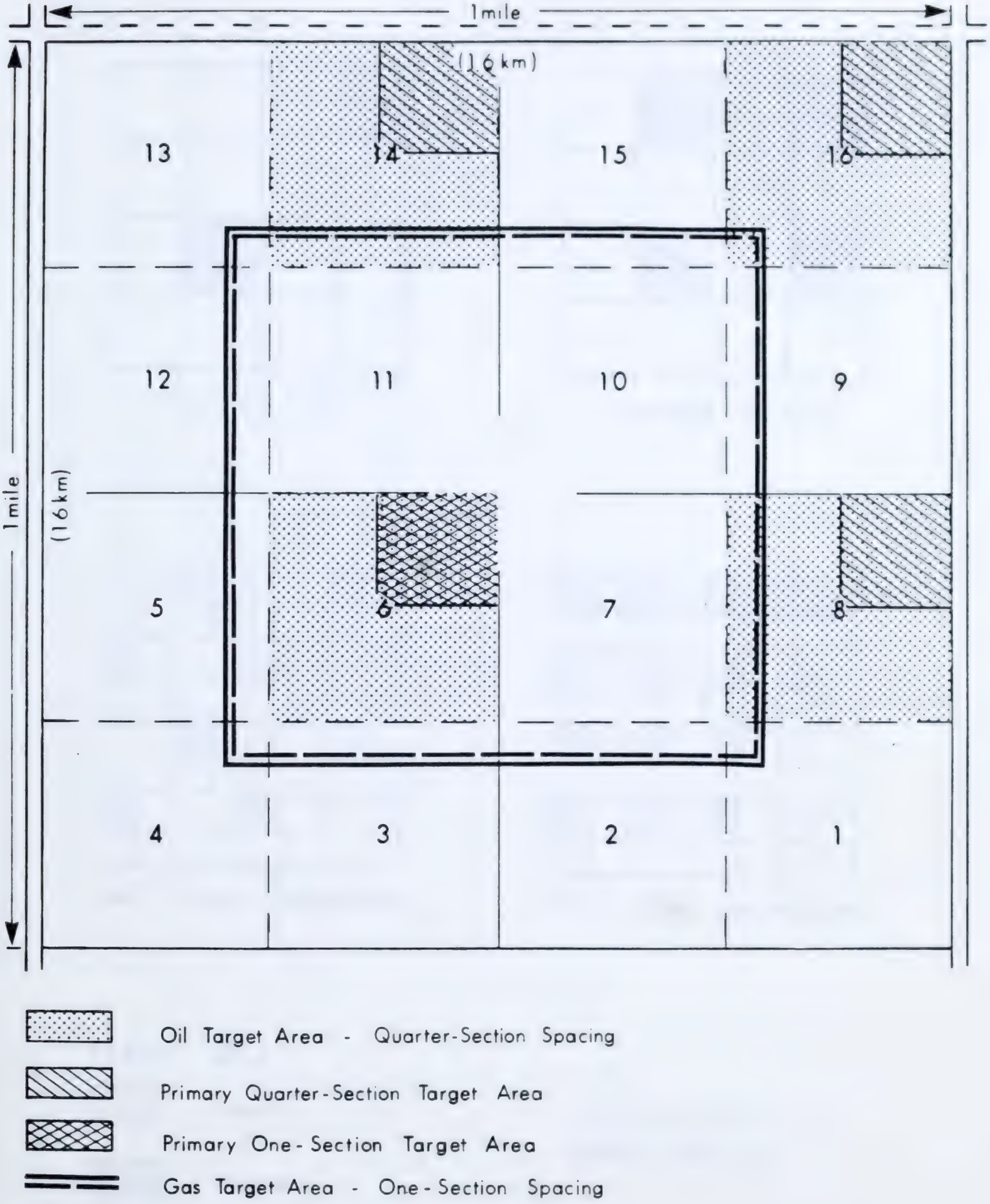
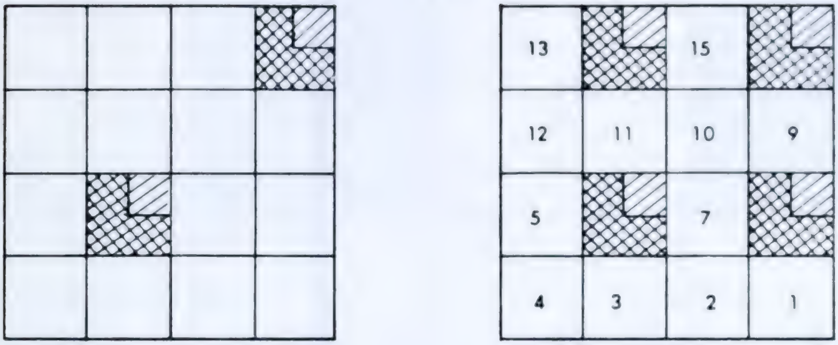
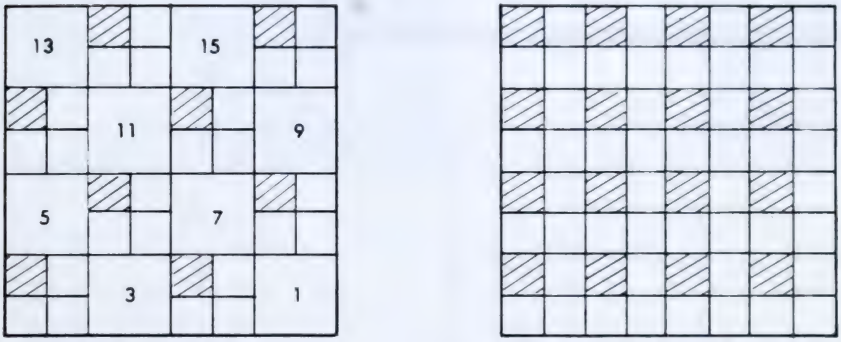

1 mile
(1.6 km)
1 mile
(1.6 km)
13
14
15
16
12
11
10
9
5
6
7
8
4
3
2
1
Oil Target Area - Quarter-Section Spacing
Primary Quarter-Section Target Area
Primary One-Section Target Area
Gas Target Area - One-Section Spacing

FIGURE 2 TARGET AREAS - AS APPROVED IN DECISION 81-20



HALF SECTION QUARTER SECTION



TWO LEGAL SUBDIVISION ONE LEGAL SUBDIVISION

TARGET AREA

▨ Primary

▩ Secondary

1 Mile = 1.6 Km.
5280 ft. = 1609.3 m.

FIGURE 3 TARGET AREAS FOR VARIOUS SIZE DRILLING SPACING UNITS - AS APPROVED IN DECISION 81-20

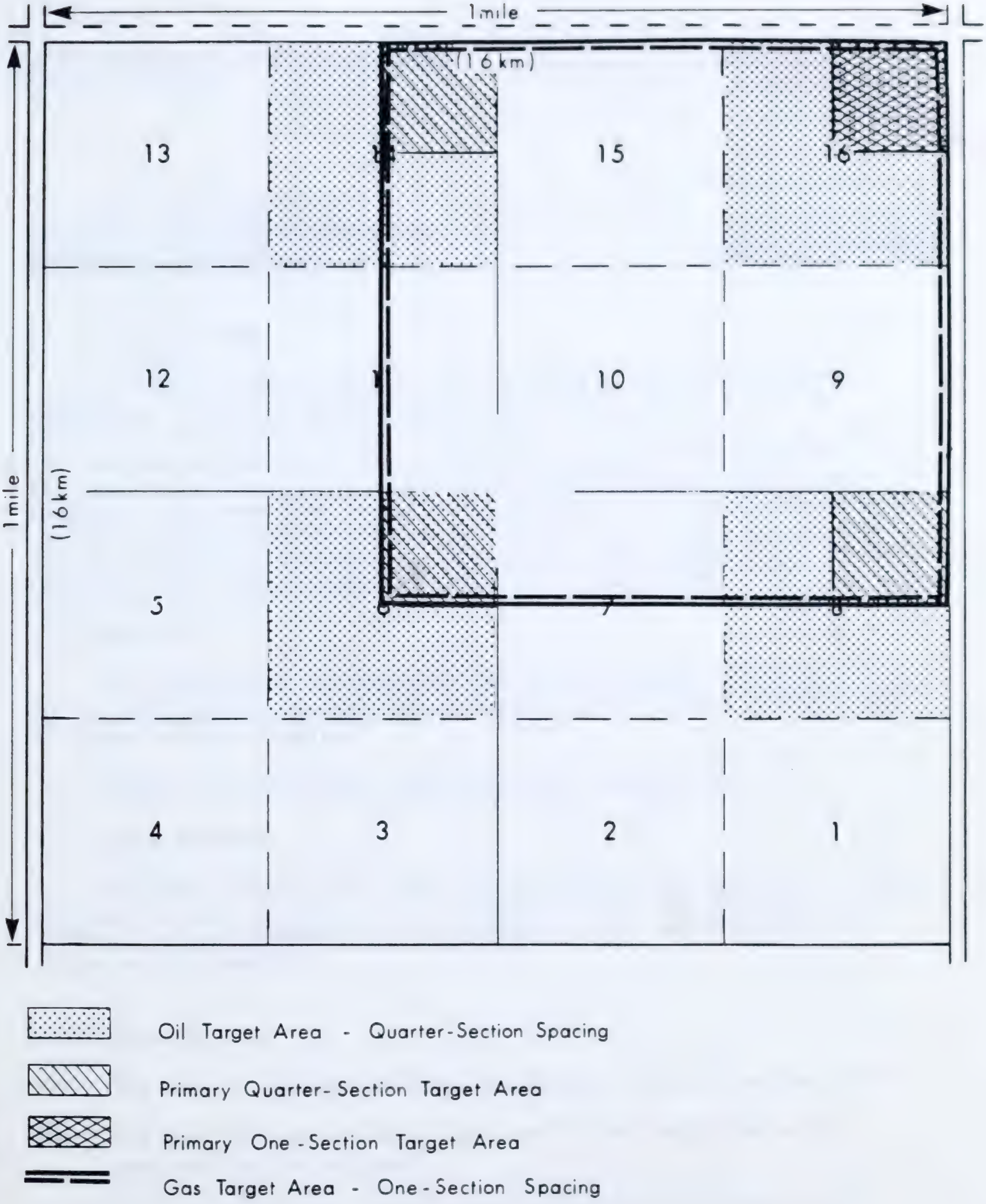

1 mile
(1.6 km)
1 mile
(1.6 km)
13
14
15
16
12
11
10
9
5
6
7
8
4
3
2
1
Oil Target Area - Quarter-Section Spacing
Primary Quarter-Section Target Area
Primary One-Section Target Area
Gas Target Area - One-Section Spacing

FIGURE 4 TARGET AREAS - PROPOSED BY THE SMOKY RIVER AND BONANZA GROUPS

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

C-I-L INC. AND TRIMAC LTD.
INDUSTRIAL DEVELOPMENT PERMIT TO
MANUFACTURE POLYETHYLENE

Decision 81-22
Application 800908

1 INTRODUCTION

C-I-L Inc. and Trimac Ltd. (C-I-L/Trimac) applied, pursuant to section 42 of The Oil and Gas Conservation Act (the Act), for an industrial development permit authorizing the use of natural gas as fuel and ethylene as feedstock for production of polyethylene in a new facility to be constructed on the applicant's existing plant site in Edmonton. The requested permit would authorize the annual use of 7.83 x 10^6 m^3 of gas and 110 800 tonnes of ethylene for manufacture of some 111 000 tonnes of polyethylene. The permit term requested was 20 years commencing with plant start-up, projected for mid-1984.

1.2 Hearing

The application was heard by the Board in Edmonton, Alberta, on 20 May 1981 with Dr. N. Berkowitz, P.Eng., C. J. Goodman, P.Eng., and N. Strom, P.Eng., sitting.

Those who appeared at the hearing are listed in Table 1.

1.3 Interventions

AEC/Esso, AEC/Du Pont, and AGEC appeared at the hearing for the purposes of cross-examination and argument only. Dow Chemical of Canada, Limited submitted an intervention to the Board but did not appear at the hearing.

2 ISSUES

The Board considers the issues raised by the application to be

- the availability and efficient use of the energy resources required for the project;
- the economic impact of the proposed project on Alberta; and
- the marketing and upgrading potential of the product of the proposed plant.

TABLE 1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
C-I-L Inc. and Trimac Ltd. (C-I-L/Trimac) M. A. Putnam, Q.C.	Dr. H. C. Rowlinson Dr. K. Jackson W. G. Pethybridge, P.Eng. T. W. Tobin J. G. Clarke, P.Eng. Dr. D. C. Eagles E. W. Lucht, P.Eng. V. P. Piana, P.Eng. Dr. J. D. McIrvine, P.Eng. G. Latonas
Alberta Energy Company Ltd. and Esso Chemical of Canada (AEC/Esso) D. G. Hart	
Alberta Energy Company Ltd. and Du Pont Canada Inc. (AEC/Du Pont) D. G. Hart	
The Alberta Gas Ethylene Company Ltd. (AGEC) F. R. Foran	
Alberta Environment staff P. Shewchuck	
Energy Resources Conservation Board staff D. A. Holgate Dr. R. Towle M. MacRae P. Raina C. Burridge	

3 AVAILABILITY AND EFFICIENT USE OF ENERGY RESOURCES

3.1 Availability of Feedstock

Views of the Applicant

The applicant expects to meet some 70 to 80 per cent of its ethylene requirements from AGEC's second ethylene unit, and to purchase the remainder from AGEC's third ethylene unit, scheduled to begin production in late 1985. A letter from AGEC, submitted in evidence, confirmed AGEC's willingness to enter into negotiations for a supply of ethylene from its third ethylene plant, and also indicated awareness of C-I-L/Trimac's wish to secure ethylene before it would actually be available from the third unit. However, the applicant did not have a contract for a supply of ethylene at the time of the hearing.

C-I-L/Trimac presented an ethylene supply-demand balance for the period 1982-1986, based on the announced timetables of prospective ethylene producers and consumers. This showed an ethylene supply deficit in 1984, with supplies approaching demand in 1986; but the applicant believed that an apparent supply tightness in 1984 could be alleviated by proper sequencing of plants, and suggested that this might be accomplished by

- not denying reasonable quantities to current consumers, particularly those whose plants are connected by pipeline to the existing AGEC plant;

- judging all projects by how much further upgrading would be undertaken in Alberta and elsewhere in Canada;

- assigning low priority to low value added materials mainly destined for export; and

- establishing realistic start-up timetables, taking into account site availability, approvals, etc.

C-I-L/Trimac stated that it would be very reluctant to defer start-up of the proposed plant in order to obtain its entire ethylene supply from AGEC's third plant, and that it accepts the risk of being unable to secure an adequate ethylene supply in the 1984-85 period.

Views of the Board

The Board's estimate of future ethylene supply and demand in Alberta had special regard for the ethylene requirements of

- currently operating ethylene derivative plants;

- derivative plants which have been approved by the Board but which are not yet operating (including those awaiting Order-In-Council);
- proposed derivative plants which have been heard by the Board prior to the hearing of C-I-L/Trimac's application; and
- C-I-L/Trimac's proposed plant;

and took into account the productive capacities of operating and approved ethylene-producing facilities (including those awaiting Order-In-Council) as well as the anticipated production rates during initial years of operation of each new plant.

The Board also assumed that ethylene presently exported from Alberta would, if required, be available for use in the province, and consequently made no special allowances for such export.

The resultant estimate of future ethylene supply and demand in Alberta is detailed in Appendix A and shows that the projected ethylene requirements of existing and approved derivative plants during 1984-85 will approach projected supplies available from AGEC's Joffre complex. If there are no undue slippages in the commissioning schedule of AGEC's second and third ethylene units, and AGEC does not experience shortages of ethane feedstock, it appears that Alberta's requirements of ethylene can be met over the foreseeable future. However, if significant slippages in the commissioning schedule of the approved ethylene producing plants do occur, and a critical supply situation develops, the allocation of ethylene supplies on the basis of the guidelines suggested by C-I-L/Trimac may have to be considered.

In light of these findings, which allow sufficient ethylene for C-I-L/Trimac's proposed project over the requested term of permit, the Board would be prepared to authorize the use of the applied-for ethylene volumes. However, since C-I-L/Trimac has not yet acquired a supply of ethylene, the Board would require C-I-L/Trimac to satisfy it, prior to plant start-up, that suitable arrangements for ethylene supply to the project have been made. The Board notes, in this connection, that the granting of an industrial development permit does not consititute an automatic allocation of resources, and that any risks associated with obtaining the required supplies devolve entirely upon the permittee.

3.2 Availability of Fuel

C-I-L/Trimac presented a letter from Northwestern Utilities Limited (NUL) in which that company indicated its ability to supply the applicant's additional fuel gas requirements through its existing facilities.

The Board is satisfied that supplies of gas in Alberta will be sufficient to meet C-I-L/Trimac's needs over the applied-for term of permit, but would, nevertheless, require C-I-L/Trimac to satisfy the

Board, prior to plant start-up, with respect to arrangements made for the required gas supply.

3.3 Efficient Use of Energy Resources

C-I-L/Trimac has been licensed to use the Phillips Petroleum Company (Phillips) slurry process for manufacturing medium and high density polyethylene resins and compounds, and submitted that this process fully meets all requirements for efficient use of Alberta's energy resources. The overall energy efficiency of the Phillips process was estimated to be some 83 per cent.

The Board notes that the overall conversion rate of ethylene would be some 98 per cent, and agrees tht the proposed process represents efficient up-to-date technology.

4 MARKETS AND UPGRADING

Views of the Applicant

The applicant projected Canadian demand for high density polyethylene (HDPE) to grow at a compound annual rate of 10.3 per cent from a 1981 level of 205 kt to 497 kt in 1990. Alberta's demand, currently 20 kt per year was predicted to grow at 12 to 14 per cent per annum through aggressive expansion of existing production facilities and the establishment of new plants.

The applicant expected initially to sell about 20 per cent of its production to Alberta processors, but eventually to place some 50 per cent of its output in Western Canada. Exports from Canada were expected to account initially for about 50 per cent of sales, but would decline to some 15 per cent by 1990. The bulk of the export volume would be sold in Pacific Rim markets, with minor amounts marketed in the U.S.

The applicant contended that a major part of its Canadian market would be generated by replacing imports from the U.S. which presently meet about 18 per cent of Canadian HDPE requirements.

Views of the Board

The Board accepts the applicant's evaluation of polyethylene markets and its view respecting potential expansion and futher development of derivative processing in Alberta.

The Board notes the applicant's admission that Canadian supply of high density polyethylene in the 1986-88 period will far exceed Canadian demand, and consequently require substantial sales to export markets. This could reduce capacity utilization rates and revenues to the province, but the Board agrees that any such adverse market conditions are unlikely to prevail over the longer term.

5 ECONOMIC IMPACT

Views of the Applicant

C-I-L/Trimac estimated that manpower requirements during the construction phase would peak at 428 persons, and that the operating phase of the proposed development would provide 85 permanent jobs. The applicant was confident of obtaining this relatively small labour force even if all announced large-scale projects in the Edmonton area proceed as planned.

The Alberta component of total capital expenditures, excluding working capital, would be some 54 per cent or $52 million (1980 dollars). Operating expenses in Alberta over a 20-year period, including the costs of ethylene, fuel gas, catalysts, chemicals, etc, were estimated to total $1389 million (1980 dollars).

The applicant assumed that federal taxes would have a 50 per cent direct impact on Alberta, and that 70 per cent of net income would be reinvested in the province. The overall direct impact on Alberta was therefore estimated as totalling $1618 million (1980 dollars); and by applying an income multiplier of 2.0, direct and indirect economic impacts on Alberta would be some $3240 million (1980 dollars).

Views of the Board

The Board accepts the applicant's estimate of manpower requirements, and agrees that competing demands for labour are unlikely to delay project completion. But it assesses the economic impact of the project on Alberta as substantially less than the applicant's estimate.

For its analysis, the Board has defined income-related impacts as Alberta's share of capital and operating costs, provincial corporate income taxes, municipal taxes, and that portion of net cash flow owned by Albertans through equity participation in the proposed project.

Alberta ownership in the project was given as 26.35 per cent. Applying this rate to net income after tax, yields an estimated $40.3 million (1980 dollars) as the portion of net cash flow owned by Albertans through equity participation in the proposed project.

As well, while accepting the applicant's estimate of capital costs ($52 million) and provincial taxes ($29 million), the Board has subtracted the applicant's estimate of ethylene and fuel costs ($1150 million) from operating expenses on the grounds that these resources, if not used by the applicant, would be used in another project.

The overall direct economic impact on Alberta of the project's capital and operating expenditures would therefore be in the order of

$360 million, and applying an income/expenditure multiplier of 2.0 results in a total direct plus indirect impact of $720 million (1980 dollars).

While less than estimated by the applicant, the Board believes this to be a substantial benefit to Alberta.

Component	Economic Impact During Project Operation (millions of 1980 dollars)
Capital Expenditures	52
Operating Costs (excluding fuel and feedstock)	239
Provincial Taxes	29
Net Income	40
TOTAL	360

6 DECISION

Having regard for its findings and responsibilities under the Act, the Board is prepared, with the approval of the Lieutenant Governor in Council, to grant the applied-for industrial development permit to C-I-L Inc. and Trimac Ltd. for a term of 20 years. The permit would be in the form shown in Appendix B, and subject to all of the terms and conditions contained therein and to any terms and conditions imposed by the Lieutenant Governor in Council.

ISSUED at Calgary, Alberta on the 7th day of August, 1981.

ENERGY RESOURCES CONSERVATION BOARD

N. Berkowitz, P.Eng.
Vice Chairman

C. J. Goodman

C. J. Goodman, P.Eng.
Board Member

N. Strom, P. Eng.
Board Member

APPENDIX A

APPENDIX A

TABLE 1 ALBERTA ETHYLENE SUPPLY/REQUIREMENTS BY YEAR 1982-1989
(10^3 tonnes/year)

A REQUIREMENTS

COMPANY	PRODUCT	STATUS	1982	1983	1984	1985	1986	1987	1988	1989	DESIGN CAPACITY
1 Canadian Industries Limited (C-I-L)	Polyethylene #1	Operating	35	35	35	35	35	35	35	35	
2 Celanese	Vinyl Acetate	Operating	22	22	22	22	22	22	22	22	
3 Dow Chemical	Ethylene Glycol	Operating	157	157	157	157	157	157	157	157	
4 Dow Chemical	Vinyl Chloride	Operating	235	235	235	235	235	235	235	235	
5 C-I-L	Polyethylene #2	Permit Issued	25	35	35	35	35	35	35	35	
6 AEC/Esso	Styrene	Permit Issued	-	-	97	114	114	114	114	114	114
7 Shell/NOVA	Styrene	Permit Issued	-	-	15	67	85	89	98	98	85
		Cumulative Lines 1-7	474	484	596	665	683	687	696	696	
8 Dow Chemical	Polyethylene	Awaiting O.C.*	-	-	125	175	184	203	203	203	175
		Cumulative Lines 1-8	474	484	721	840	867	890	899	899	
9 Shell/NOVA	Polyethylene	Applied for and Heard	-	-	65	195	260	273	300	300	260
10 Union Carbide	Ethylene Glycol	Applied for and Heard	-	-	35	105	141	148	162	162	141
11 C-I-L/Trimac	Polyethylene #3	Applied for and Heard	-	-	41	82	102	105	111	111	102
		Cumulative Lines 1-11			862	1 222	1 370	1 416	1 472	1 472	

B SUPPLY

COMPANY	STATUS	1982	1983	1984	1985	1986	1987	1988	1989	DESIGN CAPACITY
1 Alberta Gas Ethylene #1	Operating	552	552	584	617	626	626	626	626	544
2 Alberta Gas Ethylene #2	Permit Issued	-	-	328	635	725	748	748	748	680
3 Alberta Gas Ethylene #3	Awaiting O.C.	-	-	-	205	635	725	748	748	680
	Cumulative Lines 1-3	552	552	912	1 457	1 986	2 099	2 122	2 122	

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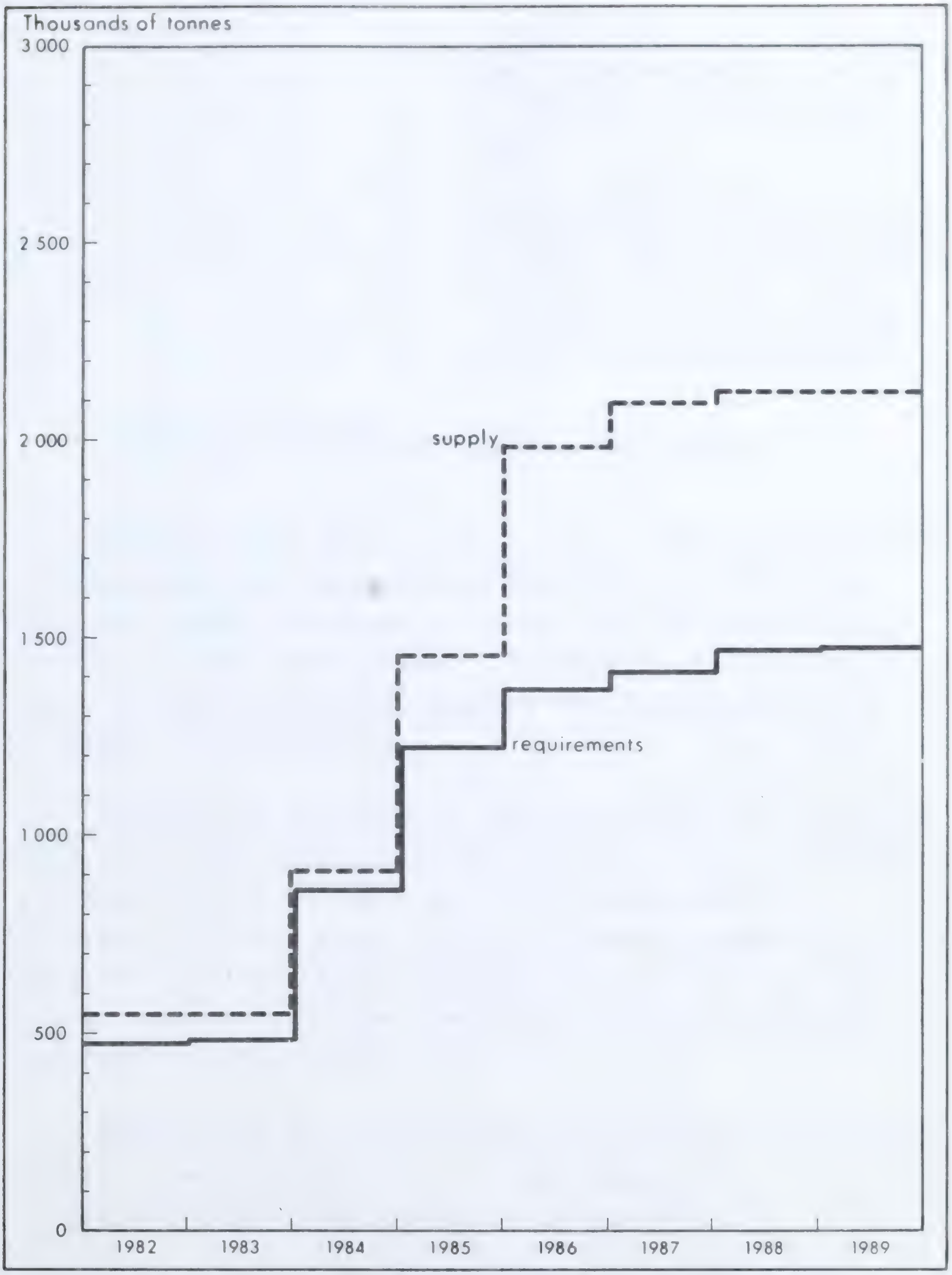
* The start-up schedule for this plant has been adjusted to account for the delay in receiving an O.C.



FORECAST OF ALBERTA'S ETHYLENE SUPPLY AND DEMAND.

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA CANADA

APPENDIX B FORM OF PERMIT

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit to C-I-L Inc. and Trimac Ltd. authorizing the use within Alberta of ethylene and gas produced in Alberta for the production of polyethylene

INDUSTRIAL DEVELOPMENT PERMIT NO. CIL 81-1

WHEREAS C-I-L Inc. and Trimac Ltd. have applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42, subsection (2) of The Oil and Gas Conservation Act, authorizing the use of ethylene and gas produced in Alberta for the production of polyethlene in Alberta; and

WHEREAS the Board is of the opinion that the granting of this industrial development permit for the use of ethylene as raw material and gas as fuel in the production of polythylene is in the public interest, having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council, by Order in Council, numbered O.C. and dated , 19 , has authorized the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to C-I-L Inc. and Trimac Ltd. (hereinafter called "the Permittees") authorizing the use of ethylene as raw material and natural gas as fuel in the production of polyethylene, subject to the regulations and orders made pursuant to the said Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use by the Permittees of ethylene as raw material and gas as fuel in the production of approximately 111 000 tonnes of polyethelene per year as described in the application from the Permittees, dated November 11, 1980.

2. The ethylene as raw material and gas as fuel authorized by clause 1 is for use in a polyethylene plant to be constructed adjacent to an existing unit located in the North-west quarter of Section 36, Township 52, Range 24, West of the 4th Meridian.

3. Subject to the conformity by the Permittees with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on December 31, 2004.

4. The quantity of energy resources that may be used in the facilities referred to herein in the production of polyethylene shall not exceed 111 000 tonnes of ethylene per calendar year as raw material nor 7 830 000 cubic metres of gas per calendar year as fuel.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37 400 000 joules per cubic metre.

6. All ethylene and gas used in producing polyethylene pursuant to this permit shall be measured by or on behalf of the Permittees in a manner satisfactory to the Board, and the volumes of ethylene used as raw material, gas used as fuel and polyethylene produced shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittees shall obtain the approval of the Board of any major changes in design of the plant facilities.

8. (1) The Permittees shall satisfy the Board prior to as to the arrangements that have been made for the supply of energy resources for the operation of its polyethylene plant, unless upon application by the Permittees a later date is stipulated by the Board.

(2) The Permittees shall satisfy the Board prior to , that construction of its proposed project has commenced or will commence on or before , and that construction of the proposed facilities will continue in accordance with a schedule approved by the Board, unless upon application by the Permittees, later dates are stipulated by the Board.

(3) During the construction of the proposed project, the Permittees shall inform the Board, on a semi-annual basis, of the progress of construction.

9. The Permittees shall operate the facilities in a manner that results in

(a) the maximum practicably obtainable efficiency in the use of ethylene and gas for the manufacture of polyethylene, and

(b) the maximum practical conservation of ethylene and gas.

10. The Permittees shall not

(a) assign this permit, or

(b) release from their control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

11. (1) Attached hereto as Appendix A and made part of this permit, is the Order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the Order of the Lieutenant Governor in Council set out in Appendix A.

12. Where it appears to the Board or the Lieutenant Governor in Council that the Permittees have contravened or failed to comply with any term or conditions contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and, with the approval of the Lieutenant Governor in Council, may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

(b) the Lieutenant Governor in Council may amend, vary, add to or replace any terms or conditions contained in this permit.

13. Notwithstanding the provisions hereof, the Permittees shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of energy resources within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

N. Berkowitz
Vice Chairman

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

UNION CARBIDE CANADA LIMITED
INDUSTRIAL DEVELOPMENT PERMIT
TO MANUFACTURE ETHYLENE GLYCOL

Decision 81-24
Application No. 800889

1 INTRODUCTION

1.1 Application and Hearing

Union Carbide Canada Limited (Union Carbide) applied, pursuant to section 42 of The Oil and Gas Conservation Act (the Act) for an industrial development permit authorizing the use of natural gas as fuel and ethylene as feedstock in the production of ethylene glycol in a new plant to be constructed near Prentiss. The proposed site, an alternative site, and certain key geographical features of the surrounding area are shown in Appendix A. The requested permit would authorize the maximum annual use of $18.4 \times 10^6 m^3$ (million cubic metres) of gas as fuel and 161×10^3 tonnes of ethylene as feedstock in the production of 264.5×10^3 tonnes of ethylene glycol. The applied-for volumes are based on 115 per cent of design capacity. The permit term requested was 20 years commencing with plant start-up, projected for 1 October 1984.

The application was considered at a public hearing in Red Deer, Alberta on 14, 15, 16, 20, and 21 April 1981, with G. J. DeSorcy, P.Eng., V. E. Bohme, P.Eng., C. J. Goodman, P.Eng., and C. J. McAndrews, sitting. Mr. McAndrews is an Assistant Deputy Minister of Alberta Agriculture, and was appointed an Acting Board Member to hear this application.

Those who appeared at the hearing are listed in Appendix B, together with abbreviations used in this report.

During the hearing, counsel for PAL, an organization in the area concerned with use of farmland, questioned whether the hearing was validly constituted, Union Carbide being a foreign-controlled corporation attempting to own land in Alberta. The Board took the position that it recognized that Union Carbide would have to satisfy the Foreign Ownership of Land Regulations, but that such was a matter beyond the Board's jurisdiction. It therefore continued with the hearing.

1.2 Interventions

The Board received a number of interventions from individuals and concerned citizens groups from the farming community. Evidence was presented on the industrial use of agricultural land, and on the social, economic, and environmental impact of the proposed industry on the rural community.

The Planning Commission presented evidence with respect to its planning policies and guidelines regarding economic growth in the Red Deer Region.

AEC/Du Pont, AGEC, and NOVA/Shell filed interventions for purposes of cross-examination and argument only. AEC/Esso presented evidence regarding future ethylene supply and demand.

2 ISSUES

The Board believes that, as a first step, it should consider whether a project such as the one proposed by Union Carbide would be desirable from a broad provincial point of view. Towards this objective, the Board considers the issues raised by the application to be:

- availability of fuel and feedstock,
- efficient use of energy resources,
- degree of upgrading of energy resources, and availability of markets, and
- economic impact on Alberta.

If an assessment of the above issues led the Board to conclude that the project would not be generally desirable, it would refuse the application and proceed no further. If the Board's conclusion was that the project would be generally desirable, it would next address the proposed site and in this regard the issues would include:

- general site selection, and
- specific site selection.

3 DESIRABILITY ON A BROAD PROVINCIAL BASIS

3.1 Availability of Fuel and Feedstock

3.1.1 Fuel

Union Carbide proposed to use gas as a make-up energy source and provided a letter from Northwestern Utilities Limited (NUL) indicating that NUL would be able to supply the proposed plant's requirements.

F.E.M. Farms Ltd. implied in its cross-examination of Union Carbide that provision of Union Carbide's gas requirements at the Prentiss site by NUL could infringe on the local rural gas co-op's franchise.

The Board is satisfied that sufficient supplies of gas will be available in Alberta to meet the applicant's requirements over the requested term of permit. However, as Union Carbide has not yet contracted for its required gas volumes, the Board would condition any permit issued to require that the permittee satisfy the Board, prior to plant start-up, as to the arrangements made for the necessary gas supplies. The matter raised by F.E.M. Farms Ltd. is one where the Board does not have jurisdiction. If a permit were issued and such a problem did arise, the Board expects it would be resolved by the involved parties.

3.1.2 Feedstock

Views of the Applicant

Union Carbide stated that it had negotiated a contract for the supply of ethylene from AGEC's second ethylene unit, and that this contract would be signed upon project approval. Union Carbide also stated that it did not foresee any problem in acquiring approval under Order in Council 213/81, which states, with respect to the output of AGEC's second unit, that AGEC shall not enter into any supply contracts for ethylene without the approval of the Minister of Economic Development.

The applicant did not provide an Alberta ethylene supply-demand forecast on an annual basis, but suggested that natural-gas-derived petrochemical feedstocks in Alberta would exceed demand to the year 2000.

The applicant stated that any delay in dealing with the application in order to consider an ethylene supply from AGEC's third ethylene plant would require a total re-evaluation of its proposal, which could put the entire project at risk of cancellation.

Views of the Interveners

AEC/Esso submitted an ethylene supply-demand balance which indicated that the volume of ethylene required to satisfy projects approved by the Board prior to the hearing of Union Carbide's application would leave an inadequate supply from AGEC's second ethylene unit for the NOVA/Shell polyethylene project (an application which was heard by the Board on 28 April 1981) and Union Carbide's proposed plant.

Views of the Board

The Board has reviewed future ethylene supply and demand in Alberta. In its evaluation, the Board included ethylene supplies which would be available from AGEC's third ethylene unit and made no allowance for ethylene volumes leaving the province. The Board recently indicated in Decision 81-10[1], that it is prepared to approve AGEC's third ethylene unit, however, the authorization of the Lieutenant Governor in Council has not yet been received. On the basis of its review, the Board is satisfied that sufficient supplies of ethylene will be available in Alberta to provide feedstock to all existing and approved ethylene upgrading facilities including those awaiting Order in Council, as well as the requirements of Union Carbide's proposed plant. The Board does note that, during the 1984-85 period, ethylene requirements in Alberta will likely approach projected supplies. Therefore, any delay in the projected start-up schedule of the planned ethylene-producing facilities could affect the commissioning date for plants which would depend on them for their ethylene feedstock. Also, the Board recognizes that there may be additional plans for the upgrading of ethylene within Alberta, for which industrial development permit applications have not yet been filed. Such projects, if they were to receive approval, would tighten the ethylene supply relative to demand.

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[1] The Alberta Gas Ethylene Company Ltd., Industrial Development Permit to Manufacture Ethylene. Decision 81-10, June 1981.

The Board would be prepared, all other public interest matters being acceptable, to authorize the use of the applied-for ethylene volumes. However, as Union Carbide has not as yet contracted for its ethylene supply, the Board would condition any permit issued such that Union Carbide must satisfy it prior to plant start-up as to the arrangements made for ethylene supply. Further, as the granting of an industrial development permit does not constitute an automatic allocation of energy resources, the Board takes the position that any risks associated with obtaining the required supplies of ethylene feedstock would be properly those of the permittee. The Board also notes that any contract contemplated by AGEC and Union Carbide for an ethylene supply from AGEC's second ethylene unit would require the approval of the Minister of Economic Development.

3.2 Efficient Use of Energy Resources

The applicant stated that extensive use would be made of cross-exchange and heat recovery systems to conserve energy. Computer systems utilizing proprietary technology would be used for an on-line closed-loop optimization of process variables to ensure conservation of raw materials and energy. Union Carbide estimated that the proposed plant would consume some 0.61 kilograms (kg) of ethylene per kg of product, and that the overall energy efficiency of the proposed plant would be some 54 per cent.

The Board is satisfied that consumption of some 0.61 kg of ethylene per kg of product represents up-to-date technology and would be an efficient use of the province's energy resources.

3.3 Markets and Upgrading

Union Carbide stated that most of the output of its proposed plant would be required by its parent company, Union Carbide Corporation (UCC), to satisfy UCC's market commitments. Thus, about 90 per cent of the output would be sold to UCC and the remainder would be marketed in Canada.

The applicant stated that, besides the two most common uses of ethylene glycol in Alberta, as antifreeze and for gas processing, other applications exist elsewhere in the world, principally in the manufacture of polyester fibers, films, and resins. Union Carbide indicated that these potential uses are dependent on the size and location of markets, as well as on the ability to export the upgraded products in competitive markets.

The Board is satisfied that markets exist for the intended product, and that the value added by upgrading ethylene to ethylene glycol is significant. However, it is not likely that substantial upgrading of ethylene glycol to other products would take place in Alberta in the near future.

3.4 Economic Impact

Views of the Applicant

Union Carbide contended that economic impact values are not an appropriate tool to compare or rank alternative projects, and that estimates of economic impact would be important for planning purposes only.

Union Carbide estimated average manpower requirements during the construction phase to be about 1570 man-years, peaking during the third year of construction at some 900 people. The applicant applied an employment multiplier of 2.0 to reflect the total impact on the labour force.

Union Carbide estimated operating staff requirements to be 120 people with the heaviest concentration in trade skills and, for the remainder, a fairly even split among unskilled, technical, and professional people. Again, it applied an employment multiplier of 2.0, for a total employment impact of 240 jobs.

The applicant estimated capital costs to be $259 million in constant, 1980 dollars, of which $166 million would be spent in Alberta. Union Carbide applied an income multiplier of 2.0 which would result in $332 million being spent in Alberta.

In its estimate of operating costs which would be incurred in Alberta, the applicant included staff expenses, natural gas, utilities, oxygen, operating materials, in-plant distribution, municipal taxes, and rail costs within Alberta. Another category of Alberta-related expenditures was "capital related costs", which included provincial income tax and 25 per cent of cash flow, and other unspecified expenditures. These totalled $710 million in constant, 1980 dollars. An income/expenditure multiplier of 2.0 was applied, which results in an estimate of funds to be spent in Alberta of $1420 million over the life of the project.

Views of the Interveners

AEC/Esso argued that the applicant's economic impact assessment included elements which have not normally been included in other applications before the Board. It suggested a fair comparison of economic impacts among projects would not be possible if the extra items were not deleted from the total impact. The contentious items were the Alberta expenditures for natural gas and oxygen, rail costs within Alberta, and ongoing project-related capital costs subsequent to start-up.

Views of the Board

The Board accepts the estimates of manpower requirements as provided by the applicant, which would yield a combined direct and induced employment effect of about 3100 man-years during construction and 240 jobs during project operation. The Board also accepts the applicant's capital cost estimate as presented, $259 million in constant, 1980 dollars, and that $166 million would reflect the value of Alberta inputs used during construction.

The Board estimated that the project's operating expenditures in Alberta, excluding fuel and feedstock, municipal taxes, provincial income taxes, and Alberta's share of profits, would be in the order of $240 million in constant, 1980 dollars. This, combined with capital expenditures made in Alberta, would total some $406 million and comprise the approximate value of Alberta inputs used in the project.

Those impacts on Alberta and Canada in excess of the value of inputs used in the project would include municipal taxes, provincial and federal corporate income taxes, and shareholders' earnings. Inclusion of taxes here, presumes that no government expenditures would be required on behalf of the project. To the extent that incremental government expenditures would be required, the impacts would be over-estimated.

In order to arrive at an approximate value for these items, the Board had to interpret the applicant's aggregate data and make appropriate adjustments where necessary. It appears, from the evidence provided, that the applicant believed provincial corporate income taxes would amount to approximately $28 million in constant, 1980 dollars, over the life of the project. The Board does not believe this is realistic, in view of current and expected prices for ethylene glycol relative to the applicant's estimates of production costs. It is possible that the export price of the ethylene glycol, and thus taxable income, might be artificially constrained through some transfer pricing arrangement between Union Carbide and its parent company UCC. Since Revenue Canada bases its tax calculations on a deemed export price - as though the transaction was at arm's length, the Board believes that revenues, and thus income taxes were understated by Union Carbide. The Board estimates that the provincial corporate income taxes would be at least six times as large as the $28 million estimated by the applicant. This, coupled with municipal taxes and the portion of profits which would accrue to shareholders resident in Alberta, would total some $220 million in constant, 1980 dollars. The total economic impact on Alberta would thus be some $626 million ($406 million expenditures plus $220 million benefits). The Board has applied an income/expenditure multiplier of 2.0 to the total Alberta impact to estimate a combined direct and indirect impact of about $1250 million in constant, 1980 dollars.

3.5 Summary

The Board, having regard for the matters discussed above, is satisfied that Union Carbide's proposed project would be desirable on a broad provincial basis. Therefore, the Board will now deal with matters related specifically to the proposed site.

4 GENERAL SITE SELECTION

In designing a methodology for site selection, Union Carbide based its choice of a preferred region in Alberta on the availability of an adequate and reliable source of water. The North Saskatchewan, Battle, Bow, and Red Deer River regions were evaluated using the following criteria:

- availability of a sufficient and reliable source of raw water,
- reasonable proximity to the AGEC ethylene pipeline,
- presence of rail lines with sufficient capacity,
- availability of sufficient skilled labour for project construction and plant operation,
- presence of major highways or secondary roads,
- suitable facilities and services in surrounding communities, and
- availability of adequate supplies of electrical power and natural gas.

The Red Deer and North Saskatchewan River regions complied with all criteria, but the Red Deer River region was selected by Union Carbide in view of the provincial policy of decentralization of industry, and because it offered greater flexibility of access to provincial labour markets.

The Board generally accepts the criteria suggested by Union Carbide, and agrees with its choice of the Red Deer River region for the general location of its proposed plant.

5 SPECIFIC SITE SELECTION

In Union Carbide's evaluation of specific sites within the Red Deer region, it divided its criteria into essential and desirable categories. The selected site had to meet all of the following essential criteria:

- marginal agricultural land available,
- environmental acceptability,
- skilled personnel for operations,
- land options available,
- commercial mineral deposits avoided,
- water supply,
- electrical and natural gas supply, and
- infrastructure available in surrounding communities.

Compliance with the following desirable criteria would enhance the site:

- topography,
- proximity to rail lines,

- proximity to ethylene supply, and
- accessibility to major highways or secondary roads.

Union Carbide did not consider sites south of the Red Deer River due to poor rail access and the need for an ethylene pipeline river crossing. Sites near Prentiss, Alix, Blackfalds, Haynes, and Nevis were investigated. On the basis of its criteria, Union Carbide chose the Prentiss site as the most desirable. It eliminated the Blackfalds site from consideration due to its proximity to the Edmonton-Calgary population corridor, the inability to secure land options, and Alberta Environment's evaluation of the site as being environmentally unacceptable. The Haynes site did not have land options available. The Nevis site was rejected because of the presence of commercially-recoverable coal deposits in the area, difficult rail access, and close proximity to campgrounds. Union Carbide rejected the Alix site due to potential impact on its proposed industrial plant from a possible future coal mine on nearby property, unsuitable topography of the site, extra costs associated with it, and a delay to the Union Carbide project that would occur if the Alix site were to be used. Union Carbide did, however, submit more evidence regarding the Alix site than any other alternatives except the proposed Prentiss site. This was primarily due to the amount of attention focused on the Alix site by a number of interveners.

None of the interveners actually suggested a list of site selection criteria but many questioned Union Carbide respecting the validity and detailed application of the criteria it had proposed. Most interveners who opposed the Prentiss site suggested that the Alix site more adequately satisfied the appropriate criteria that should be used in a site selection.

Although the Board would not necessarily apply criteria identical to those used by the applicant, it does note that the applicant's decision not to consider seriously sites south of the Red Deer River was apparently based on two of the applicant's "desirable" criteria and not its "essential" criteria. In view of the applicant's general decision to select the Red Deer region because of the Provincial policy of decentralization, application of the essential criteria to sites in the whole region prior to elimination on the basis of desirable criteria would have been appropriate.

The Board, having regard for the list of criteria submitted by the applicant, and the interveners' views expressed at the hearing, believes that the following criteria should be considered in evaluating alternative specific sites:

- compatibility of proposed land use with existing and future land use in the surrounding area,
- topography,
- availability of land options and land-use zoning,
- availablity of suitable local infrastructure,

- biophysical impact,
- social impact, and
- availability of utilities.

In response to the broad interest displayed by interveners, the Board has applied these criteria not only to the proposed Prentiss site, but also to the available information regarding the Alix site. It recognizes, however, that detailed studies were conducted only for the Prentiss site, and the resultant volume of information cannot be compared on an equal basis to the limited information supplied for the Alix site.

5.1 Compatibility of Proposed Land Use With Existing and Future Land Use in the Surrounding Area

Views of the Applicant

Union Carbide indicated that the eastern part of Lacombe County currently has lands cultivated for barley, rapeseed, silage, and hay, and pasture for livestock. It said that land use on the Prentiss site is predominantly agricultural with approximately one half of the land cultivated and the remainder used for pasture. In a 3.2 km (2-mile) radius of the proposed Prentiss site, land is used for cereal crops, forage production, and grazing for cattle. In the immediate vicinity of the proposed site, lands owned by the Ellis family are used for crop production, a cow-calf operation, and a bluebird sanctuary. Twelve residences are located within a 1.6 km (1-mile) radius of the proposed plant site and buffer zone.

Union Carbide stated that of the some 14 quarter sections it owned or had under option at the time of the hearing, two would be involved with the plant site, about seven would be used as a controlled agricultural or buffer zone, two would be involved with the continued operation of the bluebird sanctuary, and three would be sold.

In selecting a site in the Red Deer region with low agricultural capability, Union Carbide used Canada Land Inventory (CLI) ratings in its initial survey which showed the Prentiss site to be of predominantly Class 4 land. The applicant then conducted a more detailed soil survey of the Prentiss site which applied further agricultural limitations of adverse structure, low fertility status, low moisture-holding capability, adverse topography, and excess moisture.

With respect to the two quarter sections which would be involved with the plant site, Union Carbide orginally proposed that the process area, cooling pond, and rail spur/marshalling area would require some 77 hectares (190 acres). At the hearing, Union Carbide modified its application to replace its cooling-pond alternative with cooling towers and to reduce the rail facilities area, and thus, reduce the amount of land required to some 40 hectares (100 acres). It stated that this modification of its plans was made in recognition of the substantial concern expressed by several of the interveners respecting the use of agricultural land for industrial purposes. Union Carbide estimated that, of the 40 hectares which would be used for the plant proper at Prentiss, 7.2 hectares (17.8 acres) was Class 1 or 2 land, 5.3 hectares (13.1 acres) was Class 3, 0.5 hectares (1.2 acres) was Class 4, and 27 hectares (66.6 acres) was Class 5 or 6.

The some 7 quarter sections of land which would comprise the buffer zone would be leased to local residents for agricultural use and, according to the applicant, was intended to prevent infringement upon the industrial operation of incompatible developments. Of the land within the proposed buffer zone, Union Carbide estimated that some 40 hectares (100 acres) has potential for upgrading through drainage improvement. Union Carbide stated that it would upgrade enough land to compensate for the Class 1 and 2 soils to be occupied by the plant site proper. With respect to the area of the two plant-site quarter sections which would not be occupied by the plant or related facilities, some 90 hectares (220 acres), Union Carbide stated that, although it would prefer to upgrade areas in the controlled agricultural zone, the unoccupied area could possibly be used for hay production or grazing. Union Carbide stated that it was not its intention to allow that particular area to deteriorate and implied in its testimony at the hearing that the area would in effect be part of the buffer zone under its present plans. Union Carbide stated that it would not expand into the buffer zone and had no current expansion plans. If expansion plans came about, Union Carbide would confine such expansion to this 90-hectare area.

The maximum expansion that Union Carbide envisaged was a doubling of the proposed plant. In that case, Union Carbide estimated that the land which would be occupied would be double the proposed area or some 80 hectares (200 acres) out of 2 quarter sections. Union Carbide stated that, if its project were approved, conditions limiting land use in the buffer zone to agricultural use for the life of the approval would be acceptable to Union Carbide.

One-half of an area of land on which a bluebird sanctuary has been established would fall within the plant boundaries while the other half would ultimately come under the ownership of Ellis Bird Farm Limited (Bird Farm). The Bird Farm board of directors would consist of a representative from Union Carbide, Red Deer and District Museum, Federation of Alberta Naturalists, an additional naturalist, County of Lacombe, Red Deer River Naturalists, and the Ellis family. Union Carbide proposed to perpetuate the sanctuary under the control of this group, and has held discussions with naturalist groups and scheduled a baseline study to facilitate this program.

Union Carbide proposed a soil conservation program which would ultimately prepare for reclamation upon closure of the plant. Under the program, topsoil removed from the area to be used for the plant facility would be spread over designated plots to be used for hay production. At the time the site was no longer required, all surface and subsurface facilities would be removed. The site would then be re-contoured, the soils aerated, and the conserved topsoil reclaimed and spread over the site to a depth of 15 to 20 centimetres. Then a crop rotation and fertilization program would be undertaken, and a soil survey conducted to verify that the soil capability of the reclaimed land was at least equal to what it currently is.

Although it did not conduct a detailed study on the Alix site, Union Carbide stated that CLI maps show it to be 80 per cent Class 4, 10 per cent Class 5, and 10 per cent Class 6 land. An analysis of the actual lands that would be taken out of agricultural use by the plant proper was not conducted. Therefore the estimate was based on the CLI rating for the entire section within which a plant site would be located. Union Carbide stated that the Alix site would have additional topography and moisture limitations placed on it. It maintained that both the Prentiss and Alix sites are marginal land according to its definition but noted that an equitable comparison was difficult as detailed information was available only for the Prentiss site.

Union Carbide said that oil and gas reservoirs exist in the vicinity of the Prentiss site although it is not underlain by a known field. Sub-bituminous coal reserves are found to the south and east of the site. There are no coal leases within 6 km (4 miles) of the site.

Union Carbide stated that its main concern with the Alix site related to the potential incompatibility of its process units with a possible future coal mining operation and thermal power generation plant. High ambient dust levels and potential for blasting near the Alix site would have serious adverse effects on efficient operation of the plant. Additional concern involved the future development of the coal site and the possible need for subsequent rearrangement of rail, power, and water lines.

Views of the Interveners

PAL, Unifarm, AIA, and a number of local interveners expressed similar views regarding the compatibility of the proposed, and the existing and future land uses. These interveners from the agricultural community generally expressed as their primary concern, the industrial use of agricultural land. They stated that with the growing demands industry is placing on Alberta land, it is increasingly important that protection of prime farmland be a primary goal of rural land use policy. They referred to publications by Environment Canada, the Lands Directorate, Red Deer Regional Planning Commission, Ontario Food Guidelines, the Science Council of Canada, and the Minister of Municipal Affairs in support of preserving land with high capability for agricultural purposes.

The agricultural interveners generally recognized the importance of industrial development and the Alberta government's policy of industrial decentralization. They contended that both industry and agriculture can co-exist and grow on a compatible basis provided that industry is located on land with a low agricultural productivity rating. They stated that a study being prepared by the Environment Council of Alberta shows that 50 to 60 per cent of all rural land reclassified as urban in the Edmonton and Calgary areas was in Classes 1, 2, and 3.

They said that the agricultural industry is of prime importance to the economy of Alberta. If good farmland continues to be depleted, the cost of maintaining an agricultural industry will rise due to the creation of uneconomic units. They were concerned that the cost of food production, on marginal land, would escalate if good agricultural land were depleted by the encroachment of industry. They also expressed the view that the increased tax base resulting from industrial development would not compensate for the loss of agricultural land.

The agricultural interveners stated that CLI maps are used to determine areas of various agricultural capability for crops common to that particular district or vicinity, but are not intended to be indicative of soil productivity, which requires consideration of various other factors relating to management and proximity to markets. To illustrate, they submitted productivity ratings of the Prentiss area compiled by the Alberta Hail and Crop Insurance Corporation (AHCIC) which assessed the area as Grade B on a production capability scale of A to E.

With respect to the acquisition of additional land for a buffer zone, they expressed concern regarding the opportunity that Union Carbide may have, as owner of the land, to apply for rezoning and expansion of the proposed plant; and encroachment of associated industries in the buffer area. They feared that, if industry continues the trend of purchasing land for buffer zones, industry will eventually hold a substantial amount of agricultural land. The concept of granting short-term agricultural leases for the buffer zone generated concern within the farming community that the land might be exploited for the greatest return in the short run, by minimizing input or maintenance of land quality.

To reduce the use of agricultural land by industry, the agricultural interveners suggested that an alternative location should be used and generally focused attention on the Alix site. The CLI maps distinguish the Alix area soil as Classes 4, 5, and 6. The area encompasses approximately 222 hectares (547 acres) of land, of which 122 hectares (300 acres) are not being farmed. They stated that the Alix site had a rolling topography and poor soil composition, and that a productivity rating of E was assigned to the area by the AHCIC. Additionally, according to evidence from several interveners and because it is Crown land, acquisition of the Alix site would have less impact on the escalation of farmland prices than would the Prentiss site.

The interveners from the agricultural community recommended to the Board that no further projects be approved in the County of Lacombe until the county has a complete municipal plan. They stated that, if a regional plan were in place, industry could consult the municipal government regarding suitable sites within the region prior to preparation of an application. They contended that, because of the absence of a plan, there is not a doctrine against which zoning applications can be adjudicated in terms of policy statements that have been officially adopted. They suggested that, in an effort to preserve Alberta's agricultural land, industrialization or expansion of industry into prime agricultural land should not be permitted where alternative sites exist on land with poorer agricultural capability.

The Christian Farmers opposed the concept of industry owning large blocks of land as a buffer zone. It maintained that municipal government land-use measures would be sufficient to protect the plant from infringement by incompatible uses. The Christian Farmers recommended that future applications include an estimate of farmland losses resulting from industrial development and associated indirect land uses.

The Planning Commission stated that, although the region is predominantly agricultural, it recognized and supported the shift toward increased urban growth and the associated processing and servicing activities. It stated that, in preparation for development of a regional plan, it has designed a program to provide a description of the preferred future region within a framework of goals, policies, and programs. The provincial policy of decentralizing industry has resulted in concerns regarding the present and anticipated economic activity associated with the strategic location of Red Deer. It stated that a trend is developing whereby the petrochemical industry is in effect re-centralizing into one complex in the Red Deer region, and creating development and settlement pressures contrary to the wishes and needs of some of the inhabitants in the Highway No. 2 corridor. The Planning Commission suggested that it would be more advantageous to the region if the benefits of these developments were widely distributed away from the corridor. It stated that serviceable areas located to the east and west of the corridor could accommodate development.

The Planning Commission did not wish to favour or oppose the Union Carbide development of the Prentiss site. It generally supported economic growth and diversification, and dispersal of that growth throughout the region. It recommended that the Board, government departments, and local municipalities adopt measures to minimize any adverse impact resulting from industrial growth that may affect the population, resources, values, and character of rural areas. It expressed a need for the provincial government to describe its economic strategy regarding the development of resources for the region, to facilitate it in planning direct growth and activity.

The Naturalists stated that the proposed plant would not result in hazards to the Ellis bluebird sanctuary and supported the proposal on the basis that its development would provide a valuable contribution to the preservation and enhancement of wildlife. A draft agreement between Union Carbide and the Naturalists has been prepared whereby Union Carbide would undertake to finance the operation while the Ellis family holds a life-tenancy lease. Ultimately, Ellis Bird Farm Limited would retain control of the Ellis land and would maintain the bird farm.

The Naturalists requested that the Board reserve judgement on the proposed plant until its negotiations have been completed with Union Carbide to preserve the sanctuary. It stated that the agreement would provide a benchmark and guide for future negotiations between industry and those concerned with protection of the environment.

The Buffalo Lake Project represents ten towns and villages east of Red Deer (Elnora, Alix, Mirror, Bashaw, Ferintosh, Edberg, New Norway, Delburne, Donalda, and Big Valley). It stated that, in order for Alberta to receive maximum benefit from the project, it would be necessary to disperse the economic growth generated by the development throughout central Alberta. The Council of the Village of Alix unanimously supported locating the Union Carbide project near Alix, as it would provide an economic boost to the village and distribute industrial development more effectively throughout the region. It stated that small communities in the region within 40 km (25 miles) of the larger centres of Red Deer or Lacombe have a number of attributes that would attract prospective employees.

The Buffalo Lake Project stated that Union Carbide did not adequately identify and investigate sites to the east of the AGEC plant. It stated that some of the adverse factors resulting from Union Carbide's application of criteria were subjective and could be debated. It suggested that acceptability by local residents of a project should be of primary concern when considering a site. It recommended that Union Carbide be denied its application to construct a plant at the Prentiss site, but be encouraged and assisted by provincial and local authorities to choose a more appropriate site.

Views of the Board

Clearly, the principal concern expressed at the hearing related to the use of good agricultural land for industrial purposes. Also of concern at the hearing was the impact on agriculture in the community, of an industry which would control a large area of land. The Board, on the basis of the evidence presented at the hearing, has attempted to estimate how much good agricultural land would be used if the proposed industrial plant were constructed at the Prentiss site as opposed to the Alix site, and how significant this would be in terms of the production of food.

The use of the Prentiss site would involve some nine quarter sections. However, Union Carbide stated that some seven quarter sections would be buffer zone kept in agricultural production. This would be in addition to the two quarter sections of the bluebird sanctuary that would be maintained in its present state but are outside of the so-called buffer zone. Union Carbide also presented evidence showing that the actual plant facilities, recognizing the amendment at the hearing to replace the cooling pond with cooling towers, would use only some 40 hectares (100 acres) of land. The Board notes Union Carbide's intention not to allow deterioration of the portions of the two plant-site quarter sections which would not be used by the actual facilities. The Board thus expects that present agricultural land within this area would be kept in agricultural production even though it was not identified specifically as buffer zone by Union Carbide. This view is based on Union Carbide's clear evidence that it would utilize only some 40 hectares (100 acres) as the site for the proposed plant facilities, its stated intention to minimize the use of agricultural land, and its implication that the area not used by the plant would be equivalent to buffer zone.

Detailed soil studies presented at the hearing suggested that some 12.8 hectares (32 acres) of this 40-hectare plant site would be classified as Class 1 to 4 land. If it is accepted that Class 5 to 6 land, the remaining some 27 hectares (70 acres), is clearly marginal agricultural land, the actual good land to be removed from production by the proposed facilities would be some 13 hectares (32 acres) of Classes 1 to 4 land. As stated earlier, the Board expects that Union Carbide would maintain the remainder of the two quarter sections, on which the proposed plant would be situated, at an agricultural productivity level at least equal to the current use of the land. Even if the proposed plant were to be surrounded by a strip of landscaping, as is frequently done with industrial facilities in a rural setting, the Board believes the additional loss of good agricultural land would be modest. This possible additional loss would be offset to some extent by Union Carbide's undertaking to upgrade marginal land in the buffer zone in an amount equal to the Class 1 and 2 land to be used for the plant site.

With respect to the Alix site, detailed soil studies were not made so the land must be assessed using CLI maps. The entire Alix site is categorized as Class 4 land on such maps and furthermore, as pointed out by several interveners, prospects for intensive farming of such lands are further limited for topographical and other reasons. Accordingly, the Board has concluded that no good agricultural land would be lost if the Alix site were used for industrial purposes. Therefore, use of the Prentiss site would mean a loss of some 13 hectares (32 acres) of good agricultural land relative to that which would be lost by using the Alix site. Consequently, even though the Board supports in general the position of PAL and other agricultural interveners that good agricultural soils should not normally be used for industrial or other purposes, it observes that the net loss of good agricultural land directly to the Union Carbide proposal would be modest. The resulting loss in the production of food would also be relatively small. Nevertheless, this loss is a disadvantage of the proposed Prentiss site relative to the Alix site, and must be included in any comparison of the advantages and disadvantages of the alternative sites.

There were a number of additional land-use matters raised at the hearing on which the Board believes it should comment. For example, concerns were expressed that industrial firms should not be allowed to own large tracts of land surrounding industrial facilities and identified as buffer zones. Some of the interveners pointed out that alternatives exist, for example through the use of municipal zoning. The concerns were that such lands might be exploited agriculturally due to short leases, or that such zones may simply be for future industrial expansion. The Board does not have jurisdiction to regulate the ownership of lands around industrial sites, and is reporting on this matter for the benefit of Government. The Board believes that Union Carbide should take steps to ensure that lessees operate the leased land according to farming standards equal to or better than those currently practised in the area. Respecting industrial expansion, the Board notes Union Carbide's undertaking not to expand its proposed facilities into the seven-quarter-section buffer zone, and further that Union Carbide stated that it would not object to Government restriction prohibiting it from such expansion.

The Board also observes that certain interveners suggested that, in future, proponents for industrial plants should be required to present evidence respecting total agricultural land loss due to their proposed operations. These losses would include indirect uses such as residences for population growth resulting from the industrial opertion. The Board does not consider implementation of such a suggestion to be practical, as it is almost impossible to say where and how such population would be domiciled and whether it would result in losses of good agricultural land. The Board believes this matter is one of broad policy which must be left to the direction of the Government.

The Board also received suggestions from several interveners respecting the need for detailed land-use plans within municipalities, regulations respecting the utilization of agricultural lands for other purposes, and further direction respecting the diversification of industry within the province. These are all matters beyond the Board's jurisdiction but are mentioned in this report for the information of the Government.

With respect to the potential incompatibility between Union Carbide's process units, if they were located at the Alix site, and future coal mining and thermal power generation operations in the area, the Board does not accept Union Carbide's position. High ambient dust levels would not necessarily result from coal mining operations in the area, since Alberta regulations respecting maximum particulate emissions would have to be met. Additionally, it is likely that any future coal mining operation itself would involve equipment which could not tolerate high dust levels. Further, the need for blasting has not been established. Finally and most importantly, the Board does not have an application before it respecting coal mining in the area and consequently, there is no assurance that there will be mining. If the Union Carbide plant were to be located at the Alix site and if the Board were to receive an application for a coal mine development, the Board's application handling procedures would afford Union Carbide the opportunity to demonstrate how it could be adversely affected by the proposed development.

5.2 Topography

Union Carbide stated that the proposed plant and associated on-site facilities would be confined within two quarter sections. Topography of the plant site proper at Prentiss is relatively level with a gentle slope from west to east and north to south. This would be altered by cut-and-fill, with further excavation required for foundation, ponds, and drainage. Some localized slope modification might be required at the water intake site on the Red Deer River.

Union Carbide said the Alix site has rolling topography with four to five undulations per km (6 to 8 per mile). Considerable grading and cut-and-fill would be necessary. Union Carbide estimated that the incremental cost of preparing a site at Alix would be some \$8 million compared with the Prentiss site. Union Carbide stated that the existing rail line is situated on a substantial grade on the northwest corner of the Alix site, and would not be suitable for a receiving or loading area. It stated that it would be more feasible to relocate the line to the east side of the site rather than level the area surrounding the existing line and that this could cost some \$3 million.

None of the interveners presented evidence respecting this matter but several questioned the \$8 million estimate.

The Board accepts that Union Carbide would incur greater costs preparing the Alix site than it would preparing the Prentiss site, however, it doubts whether the topography cost penalty would be as great as \$8 million. It also agrees with Union Carbide that the rail line would likely have to be relocated to provide a loading area and that this would involve an additional cost.

5.3 Availability of Land Options and Land-Use Zoning

Union Carbide stated that the site selection process began in February 1980, and that options were taken out on the Prentiss site in May and June of 1980. It presently owns or has under option some fourteen quarter sections. Union Carbide said it would apply to The County of Lacombe for re-zoning of some 117 hectares (290 acres) of the Prentiss site from agricultural to industrial classification. The Alix site is situated on Crown land.

The Board, while recognizing the importance to the applicant of obtaining its required land options, assumes that Union Carbide could obtain its necessary zoning authorization and land options on many parcels of suitable land in the general Red Deer region, including the Alix site. Therefore, the Board does not consider these matters to be advantageous to either the proposed Prentiss or the Alix site.

5.4 Availability of Suitable Local Infrastructure

5.4.1 Proximity of Labour Pool

Union Carbide projected its peak construction manpower requirement of 1188 to occur in 1983, and anticipated manpower to be in tight supply due to major projects taking place in the Edmonton area and northern Alberta within the same time frame. Union Carbide stated that, because of the southern location of the project, it may be more attractive to those living in Southern Alberta. In the event that construction manpower would not be readily available in the Red Deer area, it would consult local trade unions to implement mitigative measures to lessen the shortage. An on-site camp would be provided for construction workers.

Operating personnel would total 120 in 1984. Union Carbide stated that staff would be recruited from Alberta and across Canada and that it would also provide training opportunities in an effort to maximize employment of people from the Red Deer region. It stated that, according to experience, most of its skilled professional, technical, and tradespeople would prefer to locate in or close to larger urban centres. The close proximity of the Prentiss site to Red Deer was therefore advantageous in acquiring and retaining skilled personnel, since the commuting time from Red Deer to the Prentiss site is about 20 minutes.

The agricultural interveners maintained that the smaller communities in the Red Deer region offer a number of attributes that employees would be attracted to, and would still be within 40 km (25 miles) of Red Deer. With respect to commuting time, PAL stated that it did not endorse lengthy travel, but would rather people reside in the smaller communities developing in rural areas. It estimated commuting time between the Alix site and Red Deer to be approximately 30 minutes, taking into account the road improvements planned for that area. It suggested busing as an alternative for those who preferred to live in urban centres.

The Board accepts Union Carbide's contention that it would have less difficulty in recruiting skilled personnel if it were to locate in or near an urban centre. The Board believes, however, that the applicant would still be able to acquire its needed skilled employees if it were to locate at Alix, which is farther from Red Deer than is Prentiss. Accordingly, the Board does not consider this matter to be a significant advantage in favour of the Prentiss site.

5.4.2 Road and Rail Access

Road access to the Prentiss site would be provided from Highway 2A via Secondary Road 597 which runs 3.2 km south of the plant. Union Carbide stated that about 4 km of road would require upgrading to connect the site with Secondary Road 597. Alternative access from Highways 2 and

2A would be from the north through Lacombe on Highway 12, then in a southerly direction on Secondary Road 815 which runs 4 km east of the proposed plant site.

Union Carbide stated that a 6.5 km heavy-duty paved road would have to be constructed from the Alix site to Highway 12. In addition, Secondary Road 911 from AGEC's complex to the Alix site (24 km) would have to be completed to accommodate commuting personnel.

The Red Deer region is served by both Canadian National (CN) and Canadian Pacific Railways. The CN Brazeau subdivision tracks presently cross the proposed Prentiss site on the southwest corner. A rail line presently crosses the Alix site on the northwest corner but, because of adverse topography, would have to be relocated on the east side, necessitating the construction of an additional 4-km spur line.

The agricultural interveners stated that Highways 12 and 21, and the proposed extension of Secondary Roads 597 and 911 would provide good access to the Alix site.

Respecting road and rail access, the Board agrees with Union Carbide that a considerable length of heavy-duty paved road would be required for access from the Alix site to Highway 12. The Board accepts Union Carbide's estimate that there would be a related cost of some $6 million, and therefore concludes that the Prentiss site has an advantage over Alix site respecting road and rail access.

5.5 Biophysical Impact

5.5.1 Impact on Land

As described previously under Section 5.2 - Topography, the proposed plant and associated on-site facilities would be confined within two quarter sections. Union Carbide stated that the land surface would be altered by cut-and-fill, with further excavation taking place for foundations, ponds, and drainage. Some localized slope modifications could be required at the water intake point on the river. Topsoil removed for construction of the plant facility would be conserved and later reclaimed upon abandonment of the site.

Jones Creek, which runs through the southern half of the proposed plant site, would be re-channelled between a treed area and the boundary of the process area. Union Carbide described local groundwater levels as ranging from 0.6 to 2.2 metres below grade, with water levels expected to fluctuate 0.9 to 1.5 metres on an annual basis, and possibly more within the surface water drainage channels. Because the plant site would be located in the drainage system of Jones Creek, Union Carbide stated that the flow for dewatering the area would take place towards the creek. This would also occur if water were discharged to the surface. Process area surface drainage, as well as surface drainage from non-process areas if necessary, would be contained, analysed, and upgraded to ensure compliance with Alberta Environment's water quality standards. Union Carbide has commissioned a hydrogeological study for the proposed site.

The agricultural interveners expressed concern regarding surface drainage, particularly during flash floods and heavy spring run-off, whereby materials on-site, materials in land-fill sites, and process water may flow into surrounding properties and drainage systems.

5.5.2 Water Quality

Union Carbide stated that the proposed plant would have an average gross water withdrawal rate of approximately 410 to 570 cubic metres per hour (m^3/h) from the Red Deer River. Union Carbide estimated net water consumption to be about 50 per cent of the gross withdrawal rate, with return of waste water and cooling water blowdown to the river. Water effluent discharge was expected to be 183 m^3/h. This volume may be subject to change in light of the decision to use cooling towers as opposed to a cooling pond. Union Carbide expected impact on the water supply from the Red Deer River to be minimal as the project is scheduled for operation after completion of the Dickson Dam, which is expected to result in minimum flows of approximately 58 000 m^3/h. Sampling and analysis of plant effluent would be carried out on a regular basis. Surface and groundwater sampling sites would be designated in 1981 and monitored on a quarterly basis to determine the development of any trends.

5.5.3 Air Quality

Views of Union Carbide

Union Carbide stated that gaseous contaminants from the proposed plant would be limited to nitrogen oxides from the two steam boilers, and emissions from the carbon dioxide recovery vent and emergency vents.

Gas-fired steam boilers would emit carbon dioxide, water vapour, oxides of nitrogen, and an estimated 1.8 kg per day of sulphur compounds.

One stream from the ethylene oxide unit would be a 50/50 mole per cent mixture of carbon dioxide and water vapour, with approximately 0.1 weight per cent ethylene. Union Carbide proposed to process this stream to recover carbon dioxide and ethylene, upon confirmation of a market for carbon dioxide. Should this market not develop, the stream would be vented to the atmosphere and the discharge stack would be designed such that ground-level concentrations of ethylene would not exceed 40 micrograms per cubic metre (0.035 parts per million) over a 24-hour average, equal to Alberta Environment's standard for maximum ground-level concentrations of ethylene to avoid vegetation damage.

Emergency venting would be very infrequent. On the basis of its experience with other ethylene glycol plants, Union Carbide expected emergency venting to take place for a maximum of two 15-minute periods per year. The applicant provided a range of compositions of emissions from emergency venting.

Union Carbide stated that at no time would the plant emissions become hazardous to the growth of crops and stated that confirmation of this would be in its applications to Alberta Environment under The Clean Air and Water Acts.

Views of the Interveners

PAL contended that because the proposed plant was to be located in an agricultural community, greater emphasis by way of more extensive data on emission rates should have been provided. It expressed concern regarding the absence of detailed studies on the present ambient levels of ethylene in the area. It made reference to the U.S. Agricultural Research Service as having stated that recommended levels of ethylene in a rural area for a one-hour maximum period should be 0.25 parts per million (ppm), and for an eight-hour period, 0.06 ppm. It stated a more reasonable level would be one-tenth of this: 0.025 ppm and 0.006 ppm, respectively. PAL stated that more detailed studies should be submitted regarding levels of ethylene concentrations that would be acceptable before being injurious to the growth of crops common to the area of the proposed site, what the synergistic effects of emissions from the proposed plant and other industries within the area would be, and possible interactions between plant emissions and herbicides and pesticides used by local farms.

Superior Sod Farms said that emissions from the plant would be detrimental to the operation of a feedlot it proposed to locate south of the proposed site. The feedlot would use, experimentally, cuttings of turf grasses high in protein content to be grown at the feedlot. It stated that a stable rural environment was required or the data generated from the feedlot operation would be meaningless. In addition, it referred to literature on the toxicology and explosive properties of ethylene glycol in terms of potential hazards to cattle and staff at the feedlot.

5.5.4 Odours

Union Carbide stated it would take all necessary steps to minimize odours associated with plant operation and that disagreeable odours would not be detectable beyond the plant boundaries.

The agricultural interveners expressed concern that Union Carbide may have designed the buffer zone to inhibit detection of any objectionable odours by local residents.

5.5.5 Noise

Union Carbide stated that it would implement noise control specifications in the design of the plant and advised that there would be essentially no increase in noise levels at the boundary of the buffer zone.

The agricultural interveners recognized that noise levels would be kept within Alberta standards, but stated that any noise produced in a rural community would affect the population who are accustomed to a relatively quiet environment.

The Planning Commission stated that there is a need for provincial standards on environmental noise. It requested a continuance of monitoring of noise levels at the plant.

5.5.6 Views of the Board Respecting Biophysical Impacts

With respect to the biophysical impacts of the plant on the proposed site, the Board is satisfied that adherence to all requirements of the Board and Alberta Environment would limit the impact to a minimal and acceptable level. Appropriate monitoring would be required to ensure that all standards are met. In particular, if the plant proceeded, the Board would expect monitoring and control of noise to be conducted on an ongoing basis.

The Board believes that matters of air and water quality, noise and water requirements by the plant would not differ at either site. However, it recognizes that topography alterations required at the Alix site would be more extensive and also subject to Alberta Environment's standards. Plant site drainage at the Prentiss site would need to be closely monitored due to alterations in the Jones Creek drainage system. Overall, the Board sees little difference in the two sites insofar as biophysical impact is concerned.

5.6 Social Impact

Views of Union Carbide

Union Carbide stated that although it was difficult to predict the geographic distribution of workers or the prevailing employment conditions, it anticipated that local residents would fill a number of field labour jobs and construction support positions for which Union Carbide would provide training. It anticipated competition in other construction trades represented by unions which have hiring halls in Edmonton and Calgary. Benefits would be provided as a result of indirect employment opportunities created through local purchases of materials, equipment, and services.

Of the plant's 120 operating positions, some 70 per cent would be classified as tradesmen or unskilled. Union Carbide would provide training programs for these jobs and would attempt to fill them from the local region. Union Carbide would also attempt to fill the remaining technical and professional positions from the Red Deer area wherever possible.

In addition to population increases from indirect employment generated by the project, Union Carbide estimated direct population impacts for the Red Deer area. It conducted a telephone survey to obtain a preliminary estimate of impact on community populations. A maximum impact scenario indicated that the resultant population increase would be approximately 385 for the Red Deer region, of which 210 would impact the City of Red Deer. The proposed plant would lead to increased demands on housing, recreational facilities, and social services, particularly in Red Deer, Lacombe, and Blackfalds. Union Carbide submitted a letter from the Planning Commission which stated that the expected population increase would not be of significant scale to create any adverse effects on the community infrastructure and services of Red Deer. The accommodation of construction workers in an on-site camp would minimize impact on the available housing in the area.

Union Carbide referred to a plan to establish a permanent community relations office, as a continuation of its public participation program, to deal with matters that may occur during the construction and operations periods. Union Carbide stated that establishment of a committee to work with the community was a good suggestion but it had not firmed up its plans in that regard. It said that, if its project were approved, it would join with similar efforts of AGEC, although it questioned the need for a formal structure with just two major producers in the area.

Views of the Interveners

The agricultural interveners expressed concern about maintaining a good farming community. PAL stated that the cumulative effect of the AGEC complex and the NOVA/Shell polyethylene plant, if approved, would create a substantial impact on the region. It supported siting the Union Carbide plant nearer a smaller community such as Alix. It maintained that, if the plant were located near a smaller community, fewer families would be disrupted and the development would boost the town's economy. PAL expressed concern with respect to an increase in crime during the construction period.

The Planning Commission stated that the dispersal of petrochemical development would assist in minimizing the impact of such development on the agricultural community. As well, tax, infrastructure, and servicing benefits would be spread more widely. The impact of economic growth would be felt throughout the region with job opportunity benefits more widely spread.

The Buffalo Lake Project supported a relocation of the plant to the Alix area. It stated that the town would support such a decision and that, if residential or commercial development were necessary, it could be undertaken just as economically in a smaller centre. It stated that this area presently has excess capacity in terms of schools and recreational facilities.

Some of the interveners questioned Union Carbide with respect to its plans for the ongoing monitoring of social and environmental effects of its proposed plant.

Views of the Board

The Board believes that a project of the scale proposed would likely result in some short-term problems during the peak construction phase, particularly in the area of public protection. Relative to the services now available in the region, it expects that these would not be serious and could be dealt with as neccesary by local authorities, if Union Carbide makes such authorities aware of its plans and schedule. The Board is satisfied that population growth related to the operating stage could be reasonably accommodated by the gradual expansion of housing, recreational facilities, transportation, law enforcement, and social services already available in the area. The Board notes, however, that the cumulative effects of petrochemical projects approved for the Red Deer region, warrants careful consideration by government agencies responsible for infrastructure matters. If the project is approved, the Board suggests that a community liaison committee involving all parties should be established to improve and maintain the working relationships of Union Carbide and other industrial operators in the area with the local community.

The Board does not believe that the social impact of the proposed facilities on the region would be significantly different whether the plant were located at Prentiss or Alix.

5.7 Availability of Utilities

Feedstock

Union Carbide stated that its required ethylene would be purchased from AGEC's Joffre complex and would be transported via a 9.6 km (6-mile) pipeline to be constructed on an existing ethane pipeline right of way. An additional 19 km (12 miles) of ethylene pipeline on a new right of way would be required to service the proposed plant if it were located at the Alix site.

Power

Union Carbide said that Calgary Power Ltd. would supply the electrical power required by the plant, although specific supply routes may be subject to completion of Calgary Power's Transmission Development Study for its service area east of Red Deer. It suggested that a power supply would cost some $2 million more for the Alix site than the Prentiss site.

Water

Union Carbide set out the availability of an adequate water supply as fundamental, and the close proximity of the Red Deer River rendered all sites in the preferred region acceptable with respect to water supply. Approximately five miles of water pipeline would be required from the river to the Prentiss site.

Some of the interveners contended that the Alix location would have the advantage of requiring a shorter water pipeline than the Prentiss site, but Union Carbide expressed concern regarding competition for intake sites in the Alix area considering potential future industrial and residential users in the area.

Views of the Board

The Board believes that Union Carbide would be able to secure its required utilities at either the Alix or Prentiss sites, but it notes that some additional costs would be incurred by Union Carbide if it were to locate at Alix.

5.8 Overall Conclusion Respecting Site Selection

The preceding assessment indicates that the Board sees little difference respecting the proposed Prentiss and a possible Alix site with respect to the availability of land options and land-use zoning, the availability of suitable local infrastructure, and the biophysical and social impacts. The Prentiss site has the disadvantage that it would result in the net loss from agricultural production of some 13 hectares (32 acres) of good agricultural land relative to the Alix site, and in the transfer of some nine quarter sections from agricultural to industrial ownership. On the other hand, use of the Alix site would result in incremental costs for site preparation, rail loading facilities, paved road access and power supply. In the Board's view, these additional costs could total some 10 to 20 million dollars. Additionally, Union Carbide contended that requirement of a site other than the proposed Prentiss site would delay the project, or cause it to be indefinitely shelved, and at best this would involve additional inflation costs. The Board is of the view that this latter point should not be a prime consideration in the appraisal of the site. In the absence of a Government directive prohibiting the use of agricultural land for industrial or other purposes, the Board believes it must consider each application before it on the basis of the merits of the individual case. The Board believes that a proponent should be prepared to accept some additional costs in using a site of lower agricultural quality compared with a site of reasonable or good quality involving less costs. It also believes that the impact on agricultural land by itself cannot be weighed against the added costs, both public and private, in order to justify them. This is due to the many influences an industry has on land and people external to a specific site. In this particular instance, the Board concludes that the loss in agricultural land and other influences do not outweigh the extra costs and other considerations regarding the Alix site, and consequently should not cause the application to be refused.

Notwithstanding the above conclusion, the Board is concerned that good agricultural land continues to be used for industrial purposes. The Board believes that future applicants must make greater efforts to investigate alternative sites that are not good productive agricultural land and yet are not so different in nature or location that they would cause a significant economic penalty.

6 DECISION

Having regard for its responsibilities under the Act, the Board is prepared, with the approval of the Lieutenant Governor in Council, to issue the permit requested by Union Carbide. The Board believes that a permit term of 20 years, as requested by Union Carbide, would be appropriate. The permit would be in the form shown in Appendix C and would be subject to any conditions contained therein and to any conditions imposed by the Lieutenant Governor in Council.

DATED this 21st day of September, 1981.

GJ DeSorcy

G. J. DeSorcy
Vice Chairman

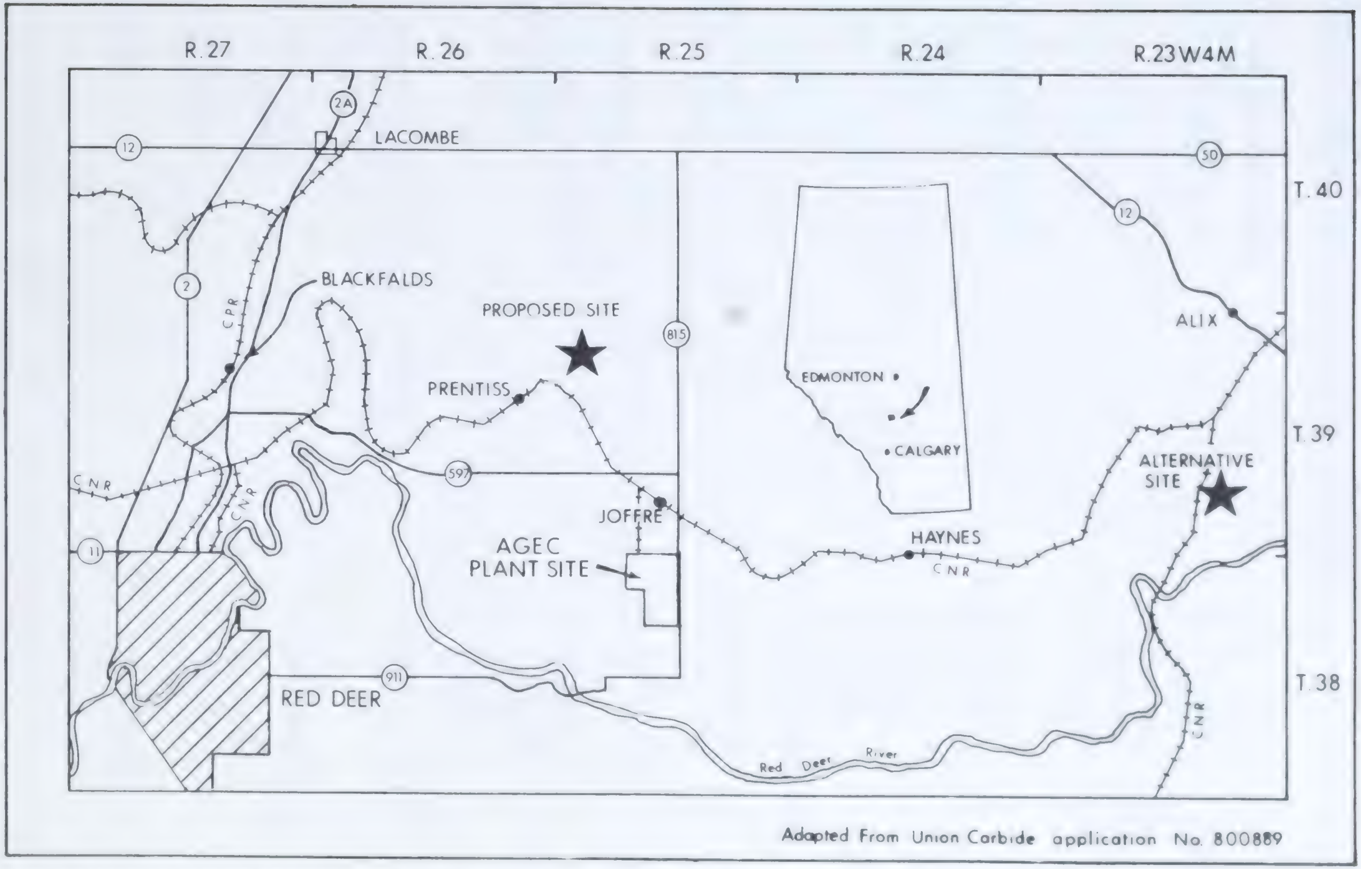
V. E. Bohme

V. E. Bohme
Board Member

C. J. Goodman

C. J. Goodman
Board Member

C. J. McAndrews
Acting Board Member



Adapted From Union Carbide application No. 800889

APPENDIX A LOCATION OF THE PRENTISS AND ALIX SITES

APPENDIX B TABLE OF HEARING PARTICIPANTS

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Union Carbide Canada Limited	D. C. Champ, P.Eng.
(Union Carbide)	D. H. Boyd
J. W. Beames, Q.C.	D. G. Colley, P.Eng.
	B. Mennie, P.Eng.
	W. Lindley, P.Eng.
	G. Engbloom, P.Eng.
	J. Donaghy, P.Eng.
	L. Brocke
Preserve Agricultural Land	F. Mueller
(PAL)	G. Friesen
D. Estrin	G. Sharp
L. Duncan	B. W. Hainsworth
	B. Pocock
	F. Street
	K. Ditzler
	F. Dobinson
	Dr. C. F. Bentley
Craigievar Farms	C. G. Sharp
C. G. Sharp	
Unifarm	E. Suominen
E. Suominen	
Christian Farmers Federation	J. Kolkman
(Christian Farmers)	J. Sieberga
J. Kolkman	J. Vandermeulen
	G. Talsma
	R. Prins
Red Deer Board of the Alberta Institute of Agrologists (AIA)	G. Winia, P. Ag.
G. Winia, P. Ag	
Superior Sod Farms	E. Polukoshko
E. Polukoshko	
F.E.M. Farms Ltd.	F. Mueller
F. Mueller	
R. J. Carlyle	R. H. Carlyle
G. Friesen	G. Friesen

APPENDIX B TABLE OF HEARING PARTICIPANTS (cont'd)

Principals and Representatives (Abbreviations Used in Report)	Witnesses
J. W. Hainsworth	J. W. Hainsworth
M. and E. Russell	M. and E. Russell
D. C. Low	D. C. Low
D. Chessor	D. Chessor
A. P. Sather	A. P. Sather
Red Deer River Naturalists (Naturalists) K. Larson	K. Larson
Red Deer Regional Planning Commission (Planning Commission) W.G.A. Shaw, MCIP L. C. Currie, MCIP	W.G.A. Shaw, MCIP L. C. Currie, MCIP
Buffalo Lake Regional Resources Project (Buffalo Lake Project) N. Wagstaff	N. Wagstaff
Alix Chamber of Commerce N. Wagstaff	N. Wagstaff
Village of Mirror N. Wagstaff	N. Wagstaff
Alberta Energy Company Ltd. and Esso Chemical Canada (AEC/Esso) D. G. Hart	
Alberta Energy Company Ltd. and Du Pont Canada Inc. (AEC/DuPont) D. G. Hart	

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Alberta Gas Ethylene Company Ltd. (AGEC) F. R. Foran	
NOVA, AN ALBERTA CORPORATION and Shell Canada Limited (NOVA/Shell) F. R. Foran	
Alberta Environment staff K. Smith J. Defir, P.Eng.	
Energy Resources Conservation Board staff M. J. Bruni, Board Solicitor K. Johnston T. Walden P. Raina C. Burridge	

Submissions were also received from the following who did not appear at the hearing:

S. E. Park

Blindman Women of Unifarm #9147

Stettler and District Economic Development Board

Dow Chemical of Canada, Limited

APPENDIX C - FORM OF PERMIT

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit to Union Carbide Canada Limited authorizing the use within Alberta of ethylene and gas produced in Alberta for the production of ethylene glycol

INDUSTRIAL DEVELOPMENT PERMIT NO. UC 81-1

WHEREAS Union Carbide Canada Limited has applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42 of The Oil and Gas Conservation Act, authorizing the use of ethylene and gas produced in Alberta for the production of ethylene glycol in Alberta; and

WHEREAS the Board is of the opinion that the granting of this industrial development permit for the use of ethylene as raw material and gas as fuel in the production of ethylene glycol is in the public interest having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council, by Order in Council, numbered O.C.   and dated
                    has authorized the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to Union Carbide Canada Limited (hereinafter called "the Permittee") authorizing the use of ethylene as raw material and gas as fuel in the production of ethylene glycol, subject to the regulations and orders made pursuant to the said Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use by the Permittee of ethylene as raw material and gas as fuel in the production of approximately 264 500 tonnes of ethylene glycol per year as described in the application from the Permittee to the Board dated October 22, 1980.

2. The ethylene as raw material and gas as fuel authorized by clause 1 is for use in an ethylene glycol plant which shall be located in the West half of Section 30, Township 39, Range 25, West of the 4th Meridian.

3. Subject to the conformity by the Permittee with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on December 31, 2004.

4. The quantity of energy resources that may be used in the facilities referred to herein in the production of ethylene glycol shall not exceed 161 000 tonnes of ethylene per calendar year as raw material nor 18 400 000 cubic metres of gas per calendar year as fuel.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37 400 000 joules per cubic metre.

6. All ethylene and gas used in producing ethylene glycol pursuant to this permit shall be measured by or on behalf of the Permittee in a manner satisfactory to the Board, and the volumes of ethylene used as raw material, gas used as fuel and ethylene glycol produced shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittee shall obtain the approval of the Board of any major changes in design of the plant facilities.

8. (1) The Permittee shall satisfy the Board prior to as to the arrangements that have been made for the supply of ethylene and gas for the operation of the ethylene glycol plant, unless upon application by the Permittee a later date is stipulated by the Board.

(2) The Permittee shall satisfy the Board prior to , that construction of the proposed plant has commenced or will commence on or before , and that construction of the proposed facilities will continue in accordance with a schedule approved by the Board, unless upon application by the Permittee, later dates are stipulated by the Board.

9. The Permittee shall operate the facilities in a manner that results in

(a) the maximum practicably obtainable efficiency in the use of ethylene and gas for the manufacture of ethylene glycol, and

(b) The maximum practical conservation of ethylene and gas.

10. The Permittee shall not

(a) assign this permit, or

(b) release from its control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

11. (1) Attached hereto as Appendix A and made part of this permit is the order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the order of the Lieutenant Governor in Council set out in Appendix A.

12. Where it appears to the Board or the Lieutenant Governor in Council that the Permittee has contravened or failed to comply with any terms or conditions contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and with the approval of the Lieutenant Governor in Council may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

(b) the Lieutenant Governor in Council may amend, vary, add to or replace any terms or conditions contained in this permit.

13. Notwithstanding the provisions hereof, the Permittee shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of energy resources within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

G. J. DeSorcy
Vice Chairman

Gov
Doc
Admin
E56
Alta
36

R226N

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

APPLICATION BY DOME PETROLEUM LIMITED
FOR A LICENCE TO DRILL A WELL

Decision 81-25
Application 810147

APPLICATION BY RODNEY AND LINDA ELVESTAD
FOR SPECIAL DRILLING SPACING UNITS

Application 810395

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1 INTRODUCTION

1.1 Application 810147

On 30 December 1980, Dome Petroleum Limited (Dome) applied, pursuant to section 2.020 of the Oil and Gas Conservation Regulations, for a licence to drill a well in Legal Subdivision 16 of Section 30, Township 74, Range 9, West of the 6th Meridian and having co-ordinates of 341.3 metres (1120 feet) south of the north boundary and 340.0 metres (1115 feet) west of the east boundary of Section 30 (see Figure 1), for the purpose of obtaining production from the Halfway Formation.

Dome indicated in its application that it had failed to negotiate right of access to the land in question and that Rodney and Linda Elvestad, (the Elvestads) who lease and have an option to purchase the land, objected to locating a well in either the proposed 16-30 location or in 9-30, an alternative location considered by Dome.

1.2 Application 810395

During discussions with Dome regarding the location of the well, the Elvestads concluded that with the existing target area provisions, the well site could not be moved to a location within the existing common target area that would be less disruptive to their proposed cattle operations (see Figure 2) than the location proposed by Dome. The Elvestads applied to the Energy Resources Conservation Board (Board), pursuant to section 4.030 of the Oil and Gas Conservation Regulations for a change in the orientation of the gas target area for 36 sections in Township 74, Ranges 9 and 10, West of the 6th Meridian. The change proposed by the Elvestads would shift the gas target area 290 metres (951 feet) north and 290 metres (951 feet) east such that the northern and eastern boundaries of the target area would be aligned with the northern and eastern boundaries of the section.

The area of the common oil and gas target areas would be increased from 25.3 hectares to 36.4 hectares (62.5 acres to 90 acres) and the target area that would be common to both oil and gas in the northeast quarter would be increased from 1 hectare to 16 hectares (2.5 acres to 40 acres).

The Elvestads' application was later amended from 36 sections to the 12 most westerly sections in Township 74, Range 9, West of the 6th Meridian.

The Board advised the Elvestads on 20 May 1981 that application for corner gas target areas in the province as a whole was heard by a division of the Board at a hearing in Edmonton on 16 March 1981, and, since a decision regarding that proceeding had not yet been made, it was only prepared to hear the merits of moving the gas target in the spacing unit in question, namely Section 30-74-9 W6M. The Elvestads agreed to proceed on this basis. The Board issued Decision 81-20 on 7 August 1981 which concluded that the target area for one section spacing should remain in the centre of the section and should have a primary target area comprising the northeast quarter of Lsd 6.

1.3 The Hearing

A public hearing of Application 810147 and Application 810395 as amended was held at Grande Prairie on 16 June 1981, before the Energy Resources Conservation Board, with Vernon Millard, Chairman, V. E. Bohme, P.Eng. and G. A. Warne, P.Eng., sitting.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Dome Petroleum Limited (Dome) A. L. McLarty	T. McGlynn D. Ray M. Doyle R. Taylor, P.Eng.
Rodney and Linda Elvestad (the Elvestads) J. D. Carter	R. Harpe D. Liland, P.Eng. T. Balisky R. Elvestad L. Elvestad
Total Petroleum (N.A.) Limited (Total) D. Shantz, P.Eng.	
Energy Resources Conservation Board (Board staff) D. A. Holgate L. A. Schmidt G. D. Agnew	

2 THE ISSUES

The Board believes the principal issues pertaining to both applications to be:

- the need for the well;

- the need for the well to be located in the common portion of the oil and gas target areas;
- the suitability of the following alternatives:
  - (a) directional drilling to the target area applied for by Dome from various surface locations, or
  - (b) drilling a conventional well in
    - (i) the existing common target area,
    - (ii) a revised common target area proposed in Application 810395,
    - (iii) the existing gas target area only, or
    - (iv) the existing oil target area only.

3 THE NEED FOR THE WELL

3.1 Dome's Views

Dome stated that a well is required in the northeast quarter of Section 30 to evaluate the hydrocarbon potential of all formations down to and including the Halfway Formation. Dome further stated that it was the holder of Petroleum and Natural Gas Lease No. 33115 which grants the rights to the petroleum and natural gas underlying Section 30.

3.2 The Elvestads' Views

The Elvestads acknowledged Dome's right to the oil and gas under Section 30 and to drill a well to capture the minerals.

3.3 The Board's Views

The Board agrees there is a need for a well to be drilled in Section 30.

4 THE NEED FOR THE WELL TO BE LOCATED IN THE COMMON TARGET AREA

4.1 Dome's Views

Dome stated that, since the Halfway Formation discoveries southeast and northwest of the proposed location have been gas, and since the Halfway prospect trends southeast to northwest, it expects the proposed well, if successful, would be a gas well. In Dome's opinion, there is a 40 per cent chance of a successful well in the Halfway Formation. At the location proposed, the Halfway Formation could be productive of oil, as are some wells directly south of the proposed location. Dome therefore considered it important to locate the well within the area which would be on-target for both oil and gas, although as indicated by its letter of 1 December 1980, it was most concerned that the well be located in the gas target area. In that letter, Dome offered to locate the well in Lsd 9 of Section 30 if that would be more satisfactory to the

Elvestads. Lsd 9 would be outside of the oil target area set forth in spacing order SU 1040.

Dome indicated that the seismic line on which it based its geological prognosis was run across the northeast quarter of Section 30 (see Figure 1). It advised that the location of the line had been selected before the target area for oil was moved from the central location. With the seismic data having been obtained south of Lsd 16, it was preferable, in Dome's view, to locate the well in Lsd 9 as close as possible to shot point 129, where geophysical and geological evidence best defined the prospect. However, Dome applied for the 16-30 location some 122 metres (400 feet) north of shot point 129, since it would be in the common target area. It also described earlier seismic lines that had been run in the same area and indicated that while the north-south line on the east side of Section 30 provided some confirmation of its interpretation; it was not possible to satisfactorily correlate that data with the more recent seismic information. Dome contended therefore that the east-west line provided the only reliable information and that the maximum distance it would consider locating the well from shot point 129 would be 134 metres (440 feet) approximately. In support of that position, it stated that if it drilled a dry hole more than 134 metres (440 feet) from the seismic line it wouldn't know whether the anomaly was invalid or simply missed.

4.2 The Elvestads' Views

The Elvestads agreed that target areas are necessary but stated that the common target area in the northeast quarter is too restrictive in this case. The Elvestads added that the reason they applied for a special drilling spacing unit in the Valhalla area was to allow Dome and other oil companies who may drill wells in the area more opportunity to locate wells in the common target area but in the corners of the quarter sections rather than in the middle of fields.

4.3 The Board's Views

The Board understands the desire to locate exploratory wells in common target areas to avoid the economic consequence of off-target penalties. The penalties normally are not effective until a second well is completed in the same pool but a penalty may be applied eventually. In principle, the Board believes that an exploratory well should be located where it has the best prospects for success. The evidence in this case suggests the well would most likely be a gas well. In the unlikely event of an oil discovery, the Board believes that there is sufficient flexibility in the current regulations to eliminate the off-target penalty. Notwithstanding this view, the Board believes that increased flexibility is desirable in locating exploratory wells and is investigating possible alternatives. In conclusion, having regard to the evidence relating to this particular case the Board does not believe the well must be located in the common target area. This position is supported by the fact that the applicant considered a location that would be off target for an oil well.

5 ALTERNATIVE SURFACE LOCATIONS

A well could be directionally drilled from various surface locations but reference was made to possible locations in Lsd 6, 10 and NE 16.

5.1 Dome's Views

Dome submitted that the additional cost of directionally drilling from surface locations in Lsd 6, Lsd 10 and the northeast corner of Lsd 16 would be $326,000, $212,000 and $212,000, respectively (see Figure 1). It further stated that aside from the increase in drilling costs, the increase in risk of losing the well while drilling and the additional operating costs of a highly deviated hole make directionally drilling an unattractive alternative and one that should be considered only as a last resort. The applicant stated that a directionally drilled hole from the aforementioned locations would fail to penetrate all of the potential hydrocarbon bearing formations in the prescribed target areas, thus incurring the hazard of an off-target penalty.

5.1.1 The Elvestads' Views

The Elvestads submitted that the oil industry had the technical expertise to drill a directional well from near the boundaries of Lsd 10, of Lsd 6 and from the northeast corner of Lsd 16, and did not object to a well being located in any of these locations. However, they did indicate a preference for Lsd 6 since a well there would be located off their property. The Elvestads stated that approval of their application to move the gas target area to the northeast would eliminate the need to drill a directional hole in order to locate the well in a common oil and gas target and would reduce the impact on their cattle operations.

5.1.2 The Board's Views

The Board agrees that industry has the technical expertise to drill a directional hole. In this specific case, the evidence indicates an incremental drilling cost of $200,000 to $300,000, as well as an increase in the risk of successfully completing the well. The Board agrees that a highly deviated hole introduces certain technical difficulties such as cementing the casing adequately, and, when pumping becomes necessary, an increase in pump rod and casing wear which may lead to environmental and conservation problems. The problems in directional drilling are particularly serious for an exploratory well since little subsurface information is available. The Board has compared all of these factors to the impact of the proposed well on the Elvestads' operations (see section 5.2.2) and concludes that in this instance a directional well is not warranted.

5.2 Conventional Well in the Existing Common Target Areas

5.2.1 Dome's Views

Dome stated that the proposed well location is preferable as it provides a location on target for both oil and gas and still is close enough to its seismic line to validate its seismic interpretation. Dome further submitted that the location qualifies the exploratory well for Class A drilling incentives.

5.2.2 The Elvestads' Views

The Elvestads said that the well site proposed by Dome falls in the centre of the area required for their planned purebred cattle operations (see Figure 2). Considering their operation, a well at this site would be a continuous inconvenience to operate around and represents an unacceptable risk to their cattle because of the possibility of hydrogen sulphide being present in either oil or gas which may be encountered. In addition, the well site would be difficult to isolate and the traffic into the lease would be a disturbance to the cattle and lead to reduced weight gains.

The Elvestads questioned Dome's need for its preferred location since Dome's own evidence showed that a location in the northeast quarter of Lsd 16 would encounter the Halfway structure in the area that was described as "good" by the applicant on the basis of the seismic information.

The Elvestads stated that because of the very large investments required to acquire additional land that they had to plan their future operation on the basis of the northeast quarter of Section 30. They contended that with efficient development, this quarter section could be an economic operation. The Elvestads, in describing their current farming operations, indicated that they have a fifteen-year lease on seven additional quarter sections in addition to the northeast quarter of Section 30. Their primary endeavor is raising polled Herefords in conjunction with Rodney Elvestad's father and brother who operate a farm approximately 18 kilometres (eleven miles) to the east. The two farms are operated as a partnership in which Rodney Elvestad, Rodney's father and brother are equal partners and the farms are known as the Many Springs Polled Hereford Farm.

The Elvestads submitted that their future plans for the development of the northeast quarter of Section 30 consisted of a core area comprising the farm buildings, storage area and calving barns located approximately in the centre of the quarter section as shown in Figure 2. Surrounding the core area are breeding pastures as well as a winter area for the cattle. The central area concept would reduce the labour required and permit a single-family operation.

They stated they would not proceed with their development if Dome were allowed to locate the well as proposed.

5.2.3 The Board's Views

The Board agrees that a well located on the proposed site would have an impact on the Elvestads' cattle operations, but given the present situation (ie, using eight quarter sections) the Board does not believe the impact would be of major proportions. In fact, the greatest impact would appear to be on their residence. With respect to the future mode of operations, the Board has difficulty assuming that their land holdings would be reduced to one quarter section. However, even if that is accepted, the Board notes that the development plan for the quarter is not firmly fixed and there is some flexibility in how it would be implemented.

With respect to the hydrogen sulphide content of the gas, the Board noted that other oil and gas pools in the area have an hydrogen sulphide (H_2S) content of less than 1 per cent and it does not expect any greater concentration at the proposed well. At that level it does not represent a serious hazard although the Board recognizes it could become a nuisance.

In summary, the Board concludes that although locating the proposed well in the centre of the quarter would have an unfavourable impact on the Elvestads, it would not be so great as to prevent or seriously impair their proceeding with their proposed development plan. The Board also concludes that the further from the centre of the quarter section a well site is placed; the less the impact becomes.

As indicated in section 4, the Board does not believe it necessary that the well be located in the common target area. However, it believes that the well should be located close to the seismic line and shot point 129 in particular to benefit from the seismic control. It also agrees that recognition should be given to the drilling incentive provisions. The Board further believes that a location can be chosen which meets these conditions while having only a minimum effect on the Elvestads.

5.3 Change in Gas Target: Application 810395 by Linda Elvestad

5.3.1 The Elvestads' Views

The Elvestads stated that their application to move the gas target area to the northeast portion of the section was made to provide Dome with a larger common oil and gas target area. With the increased common target area, Dome would be able to move the proposed well to the northeast corner of Lsd 16, a location the Elvestads favoured, and avoid the off-target penalty. The Elvestads stated that this location could be isolated from their cattle operation and the degree of interference substantially reduced.

5.3.2 Dome's Views

Dome said that it did not oppose the application by the Elvestads to move the gas target area to the northeast portion of Section 30 because it would benifit from it. Nevertheless, Dome stated that the change in gas target area, if approved, would have litte bearing on its application for a well licence as the reasons for locating the well in the southwest quarter of Lsd 16 (proximity to promising seismic anomaly and eligibility for drilling incentives) still remain. Dome noted that under the existing spacing order SU 1040 and with the target area move requested by the Elvestads, the proposed well location would be in the common oil and gas target area and little benefit would be gained by moving the gas target area. Dome further stated that the reasons for locating the well in the southwest portion of Lsd 16 are compelling and that it was not prepared to amend its application with respect to well location.

5.3.3 Total's Views

Total submitted that the Elvestads' application for alteration of the gas target area should be denied because of the inequities it may cause. Total said that an unpenalized well located in Lsd 16 would drain Total's lands as well as Dome's and would be inequitable for Total Petroleum. It further stated that an isolated variation in well spacing disrupts drainage patterns and reduces the recovery of oil or gas.

5.3.4 The Board's Views

The Board agrees with the Elvestads that a location in the northeast corner of Lsd 16 would be desirable from a surface owner point of view. The Board agrees with Total that an unpenalized well in the northeast corner of Lsd 16 would lead to equity problems and is satisfied that a target area shift as proposed by the Elvestads would not solve the conflict because of the mineral owner's desire to locate the well in the geologically optimum location. Therefore, the Board does not see any advantage to the proposed relocation of the gas target area in this particular section.

5.4 A Suitable Surface Location in the Existing Gas Target Area

5.4.1 Dome's Views

Dome said that it originally selected a location in Lsd 9-30 which was close to a shot point but chose the Lsd 16 site to take advantage of the common oil and gas target area. It submitted that a move of the well site approximately 122 metres (400 feet) north would not significantly compromise its seismic interpretation and would eliminate the possibility of the well being subject to an off-target penalty should oil production be obtained. The applicant submitted that a location in Lsd 10-30 was ruled out as it was too far off seismic and geological control and in its estimation a well located there would not be successful.

5.4.2 The Elvestad's Views

The Elvestads submitted that a location in 10-30 was acceptable to them as it would place the proposed well away from their planned central cattle handling facilities. However, when questioned about a well in Lsd 9-30, they indicated that such a well would be as objectionable as a well located as proposed in 16-30 since it would still be too close to their facilities and would subject their cattle to unacceptable risks.

5.4.3 The Board's Views

The Board is satisfied that a well located in Lsd 10-30 would be too far from the seismic and geologic control. A well located in Lsd 9-30 close to shot point 129 would have a greater impact on the Elvestads' operations than a well in the northeast corner of Lsd 16. However, the Board believes that locating the well in Lsd 9-30 approximately 122 metres (400 feet) south of shot point 129 would remove the well from the central portion of the cattle handling facilities contemplated by the Elvestads and would reduce the inconvenience and impact. It would also provide Dome with an on-target location for gas production and retain the well's eligibility for drilling incentives. The location would be off-target for the production of oil, however, the Board is satisfied that there is sufficient flexibility under the Oil and Gas Conservation Regulations (sections 4.030 and 15.160) for the applicant to apply for the establishment of a special drilling spacing unit which may differ from the normal drilling spacing unit in target area configuration or size to eliminate the penalty factor.

5.5 A Suitable Surface Location in the Existing Oil Target Area (North half of Lsd 16)

5.5.1 Dome's Views

Dome stated that a well located in the north half of Lsd 16 would be off target for gas production and that if the well were successful it would probably be a gas well. This location is also considerably removed from seismic control, hence if it were unsuccessful, it could be the result of missing the anomaly identified by seismic. Additional drilling in the northeast quarter of Section 30 might be necessary to test the anomaly. Dome submitted that if a well at this location were successful, the chances of forming a special drilling spacing unit would be remote because the geological interpretation of the Halfway structure would be known to the off-set mineral owners through the hearing. A voluntary pooling agreement with the off-set mineral owners would be required before a special drilling spacing unit could be formed and this would then be difficult to negotiate.

5.5.2 The Elvestads' Views

The Elvestads said that a location in the north half of Lsd 16 would be acceptable only if it were against a fence line or in the extreme northeast corner.

5.5.3 The Board's Views

The Board agrees that a well located in the north half of Lsd 16 would be off target for gas and a considerable distance away from seismic control. The Board further agrees that since the prospect of obtaining a gas well is significantly greater than of obtaining an oil well the gas target should receive primary consideration. Having regard for the concerns of both parties, the Board does not believe that a location in the existing oil target area represents a viable alternative.

6 SUMMARY OF BOARD FINDINGS

After considering the evidence, the Board finds that a successful well would likely be a gas well and that the well should be located favourably on the structure indicated by seismic interpretations. It finds that, in this case, there is no compelling need to locate the well in the common target area but believes it should be located in the gas target area. The Board finds that drilling a directional well would significantly increase drilling and operating costs and the risk of not successfully completing the well. The Board does not believe the impact on the Elvestads' operation to be so great as to warrant a directionally drilled hole. On the other hand, the Board believes that the well should be located so as to minimize the impact not only on the Elvestads' current operations, but also on their future mode of operating.

The Board finds that the Elvestads' program of facility development is in a sufficiently early stage that their plans could be modified somewhat to minimize the impact of a well site. Similarly, Dome could reduce the impact by some alteration of the well site and where practical locate any related production facilities away from the well. Accordingly, the Board concludes that while locating the well in the vicinity of the Elvestads' future cattle operations could have an impact on them, the impact need not prevent the Elvestads from proceeding with their development.

The Board finds that while the shift in gas target area as proposed by the Elvestads would appear to be beneficial to the surface owner, such a change would not affect Dome's position respecting the proposed location. Additionally, it could have a serious adverse impact on the adjacent mineral owners in terms of both equity and efficient drainage.

The Board finds that the well could be located in Lsd 9 approximately 122 metres (400 feet) south of shot point 129 where it would satisfy most of Dome's objectives while significanlly reducing the impact on the Elvestads proposed development plan.

7 CONCLUSION

The Board concludes that:

- there is a need for a well to evaluate the hydrocarbon potential of the northeast quarter of Section 30;
- there is no compelling need for the well to be located in the common oil and gas target area;

- a well site located near the Elvestads' central cattle facilities would not preclude proceeding with development of the cattle facilities (but the impact of the well would decrease as the distance from the central area is increased);
- directional drilling is not justified under the circumstances;
- a well location within 122 metres (400 feet) of shot point 129 on seismic line KAO-T 74-4.8 is desirable;
- a shift of the gas target area to the northeast portion of the section would not solve the well location problem but could create equity issues;
- a well located in Lsd 9 of 30 approximately 122 metres (400 feet) south of shot point 129 would satisfy most of Dome's objectives and reduce the impact on the Elvestads' future plans.

8 DECISION

Application 810147 is denied without predjudice to a further application Dome Petroleum Limited may wish to make for a licence to drill a well which would be located approximately 122 metres (400 feet) south of shot point 129 on seismic line KAO-T 74-4.8.

That part of Application 810395 which requests a change in the gas target area for Section 30-74-9 W6M is denied.

DATED at Calgary, Alberta, on 25 September 1981.

ENERGY RESOURCES CONSERVATION BOARD

Vernon Millard, Chairman

V. E. Bohme, Board Member

G. A. Warne

G. A. Warne, Acting Board Member

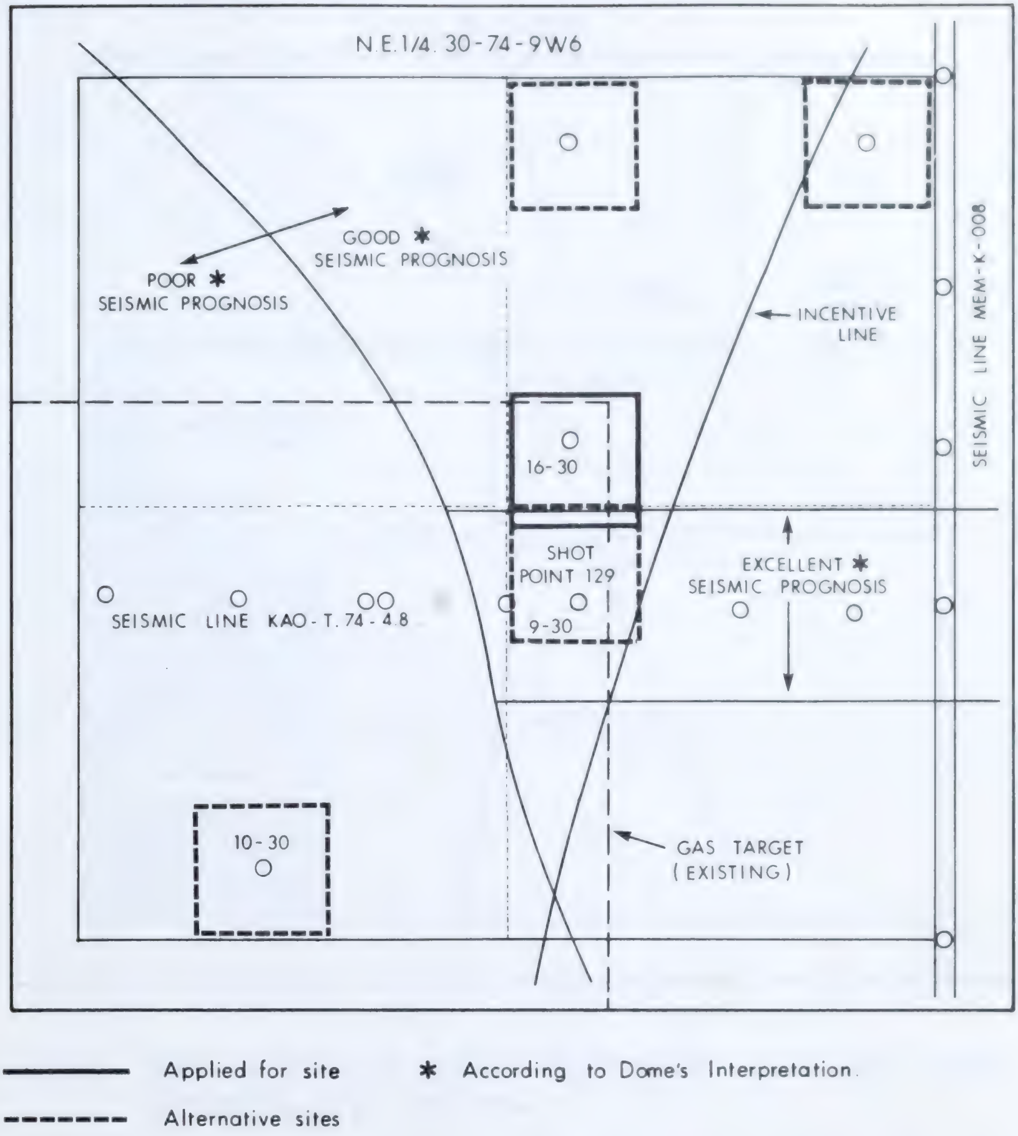

FIGURE 1 THE PROPOSED SURFACE LOCATION, ALTERNATIVE SITES, SEISMIC AND INCENTIVE CONSIDERATIONS.

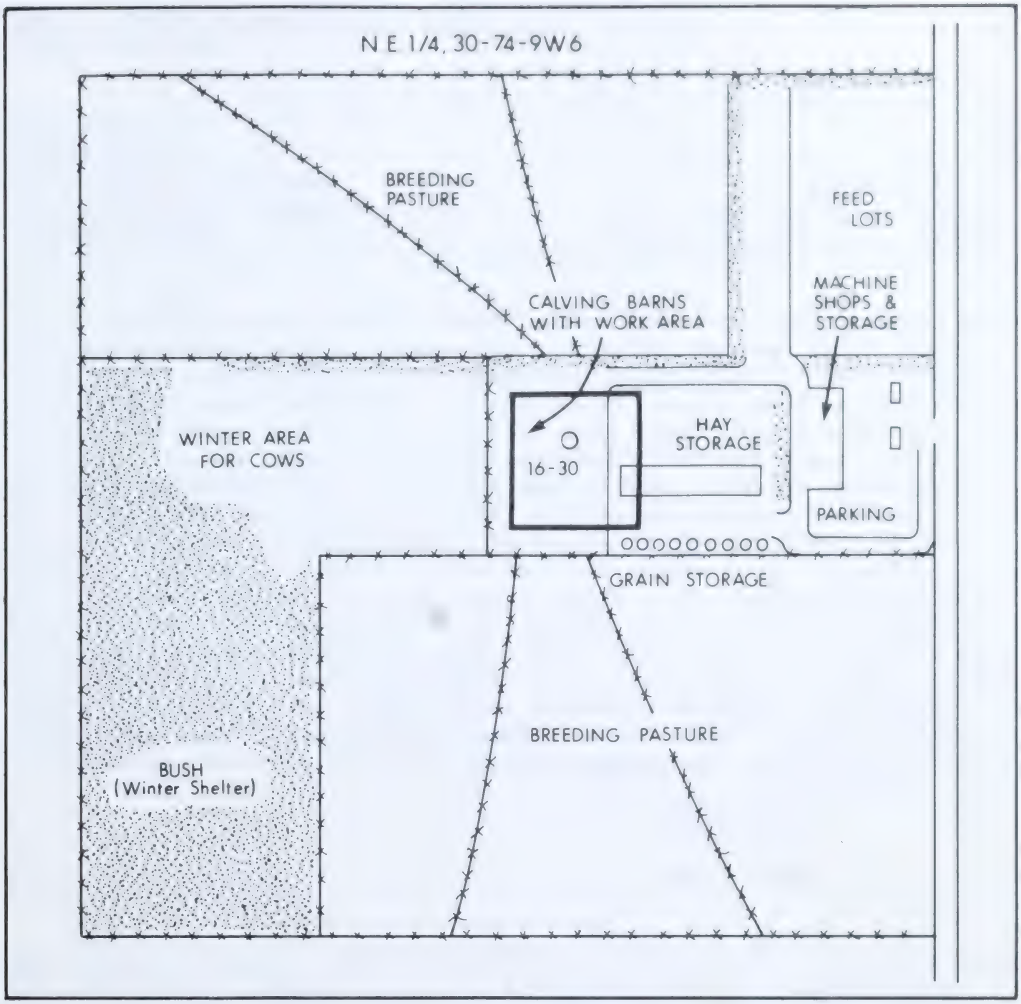

FIGURE 2 THE ELVESTADS' PROPOSED DEVELOPMENT PLAN AND DOME'S PROPOSED WELL LOCATION.

ENERGY RESOURCES CONSERVATION BOARD
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ENERGY RESOURCES CONSERVATION BOARD
Calgary, Alberta

APPLICATION BY
DOME PETROLEUM
FOR REDUCED SPACING AND
TARGET AREA REQUIREMENTS
LINDBERGH AREA

Decision 81-26
Application No. 801010
Board Proceeding No. 810132

In an Interim Decision Report, dated 6 July 1981, the Board approved 40-acre (16-ha) well spacing in the area applied for by Dome and shown in Figure 1. In addition, the Board approved 10-acre (4-ha) target areas for the north-east, south-east and south-west quadrants of each quarter section, as shown in Figure 2, where 40-acre (16-ha) spacing had been approved. In the intervening lands enclosed within the general area of the Dome application but not applied for by Dome, as shown in Figure 1, the spacing remains 160-acres (64-ha) and for consistency the Board approved a 10-acre (4-ha) target area in the south-east corner of each quarter, as shown in Figure 3. The decision on the target location of the north-west quadrant of each quarter section was witheld for further consideration. The Board issued the interim report because it recognized the importance of an early decision. This related to the need to expedite orderly oil well development in the area and avoid uncertainties in the immediate future. This report presents, in detail, the Board's reasons for the interim decision and its decision and reasons therefor on the target location of the north-west quadrant of each quarter section.

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1 INTRODUCTION

1.1 The Application

Dome Petroleum Limited applied, pursuant to Section 4.030 of the Oil and Gas Conservation Regulations, for a reduction in the drilling spacing unit in the Dome operated areas shown in Figure 1 to one legal subdivision (40-acre or 16-ha) for the production of oil from the Mannville Formation. Dome also requested that the target area be designated as the south-east quarter of each legal subdivision. At the hearing, Dome amended its application to request a 2.5-acre (1-ha) central target area in the south-east quadrant of the legal subdivision as shown in Figure 4. This area was consistent with the target area size and location proposed in the Board staff submission respecting Proceeding No. 810132.

Dome indicated that the complex stratigraphy resulted in the trapping of heavy oil in numerous small accumulations which cannot be properly delineated with 160-acre (64-ha) spacing. Dome stated that the 40-acre (16-ha) spacing was required in order to delineate and develop the approximately 38 heavy oil accumulations discovered to date. Also Dome provided evidence to show that 40-acre (16-ha) spacing (4 wells per quarter section) would more than triple the primary recovery possible from the current 160-acre (64-ha) spacing (1 well per quarter section) in the Lindbergh Area.

1.2 The Board Staff Submission

The Board staff submission was made in order to complement the target location provisions sought by Dome Application No. 801010 for other adjoining lands not included in the Dome Application. The areas included in the staff submission are shown in Figure 1.

The Board staff proposed that in those areas included in its submission and as shown in Figure 1, the Board establish the target area for a quarter-section drilling spacing unit for the production of oil from the Mannville Group to be that area of the south-east quadrant of legal subdivisions 1, 3, 9 and 11, having sides 50 metres from the sides of the south-east quadrant of the legal subdivision and parallel to it. The Board staff further submitted that if the municipality or county permitted a shorter distance than 50 metres between the road allowance and the wellbore, the assigned 2.5-acre (1-ha) square target area could be moved closer to the south-east corner of the legal subdivision. The Board staff also proposed that the target area of the one legal subdivision drilling spacing units proposed by Dome be restricted to the location and size recommended for the lands subject to the change in quarter-section target area.

The main purpose of the staff submission was to prevent a mixture of well development patterns that could result from the retention of the large central target area of a normal quarter-section spacing unit. Retention of the normal quarter-section target area could lead to a wide variety of well patterns and inter-well distances and thence to unacceptable equity and conservation problems. The Board staff believed that a restricted quarter-section target area was required to provide for the orderly and economic development of this heavy oil area.

A second purpose of its submission was to correct what the Board staff believed to be a shortcoming in Dome's application. The Board staff was of the view that Dome's request for a 10-acre (4-ha) target area could provide too much flexibility for well placement and, therefore, could lead to irregular well patterns with negative impacts on oil recovery.

A third purpose of the Board staff submission was to minimize land-use conflict where current or future farming operations could be affected.

The Board staff emphasized that its submission should only be considered, and ruled upon, if Dome's application for 40-acre (16-ha) spacing was approved in whole or in part. The submission would be withdrawn if the Dome application was denied.

1.3 Interventions

The Board received interventions from a number of surface rights groups and agricultural organizations that were concerned about the impact of well sites on the coexistent farming operations. None of the interveners who appeared at the hearing stated opposition to the proposed 40-acre (16-ha) spacing. However, they did have serious concerns respecting the location and restricted size of the target areas that were proposed by Dome and the Board staff. They also expressed concern that the move to 40-acre (16-ha) spacing might be regarded as only an intermediate step towards 10-acre (2.5-ha) spacing.

Although Unifarm and the Christian Farmers submitted written responses to the notice of hearing, neither party was present to speak to its submission at the hearing. PanCandian, Westmin and the Cold Lake and District Fish and Game Association intervened for the purpose of cross-examination and argument. Alberta Department of Agriculture submitted an intervention under Section 26 of the Board's Rules of Practice.

A list of those who appeared at the hearing is given in Table 1-1.

1.4 The Hearing

The applications were considered at a public hearing on 16, 17 and 18 June 1981, in Lloydminster, Alberta, with G. J. DeSorcy, P.Eng., C. J. Goodman, P.Eng. and N. A. Strom, P.Eng., sitting.

TABLE 1-1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Dome Petroleum Limited (Dome)	
C. K. Yates	H. J. Strain, P.Eng. A. P. Cachero, P.Eng. R. McManus, P.Geol. T. Reidy J. Lore, P.Ag.
Elk Point Surface Rights Association (Elk Point Group)	
P. T. Johnston	R. Danyluk A. Bugeja M. Miller L. Miller H. Aarbo Dr. C. F. Bently, P.Ag.

TABLE 1-1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Highway 14 East Surface Rights Group (Highway 14 Group)	
R. M. Arthur	R. M. Arthur
North East Alberta Protective Rights Association (North East Alberta Group)	
G. Gow	G. Gow E. Walters
North East Alberta Branch of the Alberta Institute of Agrologists (AIA)	
N. J. Rekimowick	N. J. Rekimowick R. Bjorkland, P.Ag.
Christian Farmers Federation of Western Canada (Christian Farmers)	
J. Kolkman	
PanCanadian Petroleum Limited (PanCanadian)	
P. J. Cummins	
Westmin Resources Ltd. (Westmin)	
D. A. Repka J. Newbert, P.Eng.	
Cold Lake and District Fish and Game Association	
J. Agnew	
Energy Resources Conservation Board (Board Staff)	
M. J. Bruni J. R. Nichol, P.Eng. C. A. Langlo, P.Geol. H. Lillo, P.Eng. H. Piet, C.E.T. M. Semchuck	J. R. Nichol, P.Eng. H. Piet, C.E.T.

2.0 GENERAL POSITION OF THE INTERVENERS

2.1 Surface Rights Groups and Farming Organizations

The interveners representing the various surface rights groups and farming organizations agreed that Dome was entitled to win the minerals on lands for which it holds the mineral rights and that 40-acre (16-ha) well spacing was appropriate for the recovery of the oil in this area by primary methods. The interveners did, however, state that this development of the energy resource base must be flexible enough to minimize the loss to the arable land base and to minimize the negative impact on the coexistent farming operations. They said it is imperative that the farmers and the oil industry representatives recognize that each group has legitimate concerns and that they work together to resolve those concerns.

The interveners contended that well sites not only removed arable land from cultivation, but also had an effect on farming economics and operations beyond the land taken in easement. Wells and access roads created irregular farming patterns and thereby created the need for extra turns, more headlands and more double-working of lands. Consequently, the Elk Point Group, the North East Alberta Group and the Christian Farmers contended that if wells were located at the perimeter of the quarter-sections, along property boundaries or adjacent to natural obstructions in the fields, the negative impact on agricultural operations would be greatly reduced. The Highway 14 Group and Unifarm, although agreeing in principle with the other interveners, believed that a single enlarged drilling location in the centre of each quarter section might be most appropriate, provided that all subsequent wells were drilled from this one location. The AIA suggested that the adverse impact on farming could be minimized by restricting all drilling operations to the southeast corner of each quarter section.

Although the interveners generally agreed with the concept of corner target areas, they did not agree with the Board staff proposal to limit the target area, for both quarter-section and one legal subdivision spacing, to a 2.5-acre (1-ha) area centrally located within the southeast quadrant of the legal subdivision. The interveners contended that a larger 10-acre (4-ha) target would be better as it would provide the flexibility necessary in finding a well site that satisfied both the interests of the landowner and the oil company.

The surface rights and farming groups also indicated that there is a definite need for improvement in the following areas:

- The manner in which lease negotiations are carried out.
- The requirements for an administration of well site, lease road and pipeline right of way reclamation.
- Action by the oil industry to relieve landowner concerns and uncertainties by discussing development plans at an early stage.

These matters will be discussed, in more detail, in later sections of the report.

2.2 Other Parties

Alberta Agriculture, in its written submission, emphasized that much of the soil in the area is among the most productive in Alberta and is rated, Canada Land Inventory Class 2c, downgraded from Class 1 by climate and the short growing season. Alberta Agriculture supported the Board staff submission relative to locating wells as close as possible to the corner of quarter sections; but went on to question whether drilling multiple wells from one pad was not more suitable for enhanced recovery operations requiring closer spacing of subsurface targets. It was claimed that, where more than one well per quarter section would be drilled, drilling from one pad would cause the least interference with agricultural operations and avoid a network of inter-well lease roads across the fields.

The Cold Lake and District Fish and Game Assocation was concerned about the social and economic impact of the proposed type of development on the surrounding communities. The Assocation was, therefore, concerned that Dome have proper regard for these aspects when preparing its overall development plans for the area. Westmin supported the Dome application and stated that one legal subdivision (40-acre or 16-ha) drilling spacing units are necessary to maximize primary recovery of the heavy oil in the Lindbergh Area.

3 THE ISSUES

The Board considers the issues of this application to be:

1. The appropriateness of closer spacing in the Lindbergh Area.
2. If closer spacing is to be approved, the appropriate size and location of the target area.

Additionally a number of other matters were raised at the hearing which would not impact on the decision but which the Board believes should be discussed. Prior to dealing with the principal issues related to the application, the Board considers it appropriate to discuss the evidence and its views respecting the geology of the area, nature of the fluids, and the likelihood and probable size of oil accumulations in the area.

4 GEOLOGY OF THE AREA, NATURE OF THE FLUID, AND THE LIKELIHOOD AND PROBABLE SIZE OF OIL ACCUMULATIONS

4.1 Views of Dome

Heavy oil accumulations in the Lindbergh Area occur in several sandstone Members of the Lower Cretaceous Mannville Group at depths ranging from 1 500 to 2 150 feet (460 to 650 metres). Dome considered the zones with the most potential for development to be the General Petroleum and Sparky Sands of what it defined as a "middle-Mannville" unit and the Cummings and Dina Members of the "lower-Mannville" unit. The sands were deposited in fluvial to deltaic and nearshore marine environments, with the primary trapping mechanism for oil being stratigraphic, with some structural influence.

Dome identified a total of 38 areas within the outlined area of application where heavy oil and/or natural gas of commercial capability had been identified during the recent period of drilling activity. Average pay thicknesses in these pools were estimated at 20 to 35 feet (6 to 10 metres), with an economic thickness cut-off of approximately 15 feet (5 metres) used to indicate the probable limits for development of heavy oil. By this method and on the basis of current drilling information, Dome estimated that about 57 of the 285 sections within the general area of application could conceivably be economic to develop on 40-acre (16-ha) spacing. Dome further estimated that of the 57 sections which were likely to be developed on 40-acre (16-ha) spacing, a maximum of 10 to 12 sections might be further developed for tertiary recovery on 10-acre (4-ha) spacing. This development would likely occur over the next 5 to 10 years.

Dome stated that oil within the Mannville Group in the Lindbergh Area is heavy Lloydminster-type crude with densities ranging from 975 to 988 kg/m^3 (13.6 to 11.7 API gravity). It said that the viscosity in this area was approximately 9 000 centipoise compared to 100 000 centipoise in the Cold Lake Area. Average porosities and permeabilities for pools in the area are 30 per cent and 2 000 to 3 000 millidarcies. It indicated that most of the reservoir and fluid data available at this time is related to the Cummings Zone.

4.2 Views of the Board

The Board notes that none of the interveners presented evidence respecting these matters. It generally accepts the technical evidence presented by Dome respecting the geology of the area, the fluid characteristics and the likelihood and possible size of the heavy oil accumulations. The Board recognizes the uncertainty respecting these matters, particularly the occurrence and size of accumulations, but believes Dome's evidence is the best information currently available and will use it as a general basis for consideration of the application.

5 THE APPROPRIATENESS OF A CHANGE IN SPACING

At the outset of this section, the Board emphasizes that the matter before it is an application for the reduction in normal quarter section oil well spacing to one legal subdivision (40-acres or 16-ha) spacing. Although evidence was provided and concerns expressed over the possibility of future requests for further reductions in well spacing, the Board is of the view that the application for 40-acre (16-ha) spacing must be considered on its own merits as opposed to the possible merits of a further reduction in spacing. Also the Board stresses that future requests for further reductions in well spacing would be the subject of new applications and would be considered on their own merits at that time.

5.1 Views of Dome

Dome contended that a reduction in drilling spacing unit size was required to delineate and develop the approximately 38 known heavy oil accumulations and to maximize recovery of the heavy oil by primary recovery methods. Dome provided evidence from geological, engineering and land use points of view in order to substantiate its position. Dome indicated that in addition to the 30 sections of land which it owned and operated, it had obtained by farm-out from Sulpetro the heavy oil rights on 120 sections of land in the same general area. Dome further stated that since it owned the mineral rights on these 150 sections, it should be permitted to develop this acreage in the most prudent manner. Having considered the nature of the heavy oil occurrences, Dome stated that the heavy oil rights could only be economically developed under primary recovery methods with 40-acre (16-ha) well spacing.

The applicant's geologic witness stated that the complex stratigraphy or sequence of sand and shale depositions, coupled with local structure and erosional features had resulted in the trapping of heavy oil in numerous small accumulations within the Mannville Formation. The pay sections, within any given zone, average only 20 to 35 feet (6 to 10 metres) in thickness and have a very limited areal extent. This makes it very difficult to correlate continuous oil-bearing zones from one well to the next, particularly with the large inter-well distances associated with one well per quarter-section spacing. Consequently, as ultimate development plans are dependent on good knowledge of the actual pool sizes, Dome contended that one well per legal subdivision spacing was necessary to allow for the proper delineation of the already discovered heavy oil accumulations.

Dome contended that 40-acre (16-ha) well spacing was clearly justifiable on the basis of the marked improvement in primary oil recovery over that obtained under 160-acre (64 ha) spacing. Dome based this contention on the results of two different analysis techniques. Under the first, Dome conducted a mathematical calculation of oil recoveries from a pool which had the same reservoir and fluid properties as those in the Lindbergh Area. Dome stated this study showed that the oil recovered from one well in a quarter section during a 15-year period (average well life), was about one third of the amount recovered by four 40-acre (16-ha) wells during the same 15-year period.

Dome indicated that its main analysis technique was to utilize actual production histories of Lloydminster Area wells to find the relationship of recovery efficiency to well spacing. Three fields, Dulwich and Golden Lake in Saskatchewan and Kitscoty in Alberta, were used in this study. The ultimate production from wells in these fields was extrapolated for various spacing patterns and the recovery in stock tank barrels per acre was then plotted against the spacing size. The resulting relationships were then adjusted for the Lindbergh Area to reflect the differences in viscosity and API gravity. This study indicated an ultimate primary recovery rate of 1.5 per cent (about 75 000 barrels) for 160-acre (64-ha) well spacing as compared to 5 per cent (about 270 000 barrels) for 40-acre (16-ha) well spacing.

Dome contended that reducing the well spacing from 160-acres (64-ha) to 40-acres (16-ha) would not remove a large amount of agricultural farm land from production or make it particularly inconvenient and difficult to farm in the Lindbergh Area. Dome indicated that on average, a heavy oil well and its associated lease-road required 1.5 acres (0.6 ha) of land which would result in a maximum of 24-acres (9.7-ha) per section being removed from agricultural production in the case of 40-acre (16-ha) spacing. Therefore, based on its estimate that only 20 per cent of the 285 available sections would eventually be developed on 40-acre (16-ha) spacing, only some 1 368 acres (554-ha) would be removed from agricultural production in the entire Lindbergh Area during the life of the heavy oil producing operations.

Dome estimated that the value of the crop loss would range from $6 000 - $7 000 per section, per year, or approximately $342 000 - $399 000 per year for the project area. Dome noted that, in its view, individual land owners would be adequately compensated on an annual basis for the loss of use, disturbance and inconvenience caused by all well sites and access roads. Dome also stated that it would work with individual land owners to develop the best configuration of well sites and roads for each section in order to minimize the impact on the coexistent land-use operations.

Dome contended that the benefits to the people of Alberta, through royalties and taxes, would be considerable. In addition, there would be benefits to the local Lindbergh Area residents and the counties of Vermilion River and St. Paul through oil industry employment and business opportunities, road improvements and municipal taxes on oil industry surface installations. Dome submitted that the loss of agricultural production from the area was not a severe penalty to pay for the foregoing benefits.

5.2 Views of the Interveners

The interveners did not specifically object to Dome's application for 40-acre (16-ha) spacing but to the location of the wells and/or target areas required to accomplish the reduction in well spacing. These concerns will be dealt with in detail in Section 6 of this report. The interveners were, however, concerned about a number of matters associated with the reduction in well spacing to 40-acres (16-ha) including loss of arable farmland from production, soil conservation and reclamation and social and economic impact on the surrounding areas.

In regards to the loss of farmland from production, the interveners estimated that the approval of 40-acre (16-ha) well spacing could result in the loss of 18 176 acres (7 355 ha) or about 10 per cent of the agricultural land in the area of application. An additional 20 per cent of the arable land could be affected by pipelines, power lines and other associated production facilities. The interveners expressed a view that this massive use of food producing land must be taken very seriously and that its impact and repercussions carefully studied before any decision was arrived at.

The interveners contended that there is a significant problem associated with soil conservation and reclamation at each and every well site and that this problem will be magnified with a reduction in well spacing and the resulting increase in the number of wells. The interveners said that the oil companies are not doing an adequate job in regards to the preservation and rehabilitation of farmland and that existing government legislation, The Land Surface and Conservation Reclamation Act, was not providing adequate protection for the landowner. Each individual well site must be examined on its own merits and a soil conservation and lease reclamation plan developed before any work proceeds at the site. The interveners contended that the Board should require the oil industry to supply these plans and that some government agency should conduct proper site surveillance to ensure that these programs are being carried out.

In addition, in cases where soil is being removed and stockpiled in some off-lease location, some central registry must be established to record the location of these stockpiles. The interveners also contended that there should be tighter requirements for the conservation and rehabilitation of soils affected by pipeline rights-of-way.

The interveners also stressed that the impact of imposing an intruding industry on a way of life must be considered. The interveners contended that the inconveniences, in addition to the material losses, created by all the lease roads, well sites and general industry activity in the area should be weighed when considering an application of this nature. The movement of heavy traffic on the once quiet rural roads creates not only aesthetic and environmental pollution problems but a definite safety hazard to the children playing on the roads and to the landowners moving farm machinery from one field to another. According to the interveners, all of these factors and many more tend to deteriorate the quality of life in the area and as such every effort should be made to minimize the factors which produce the negative impacts on both the material and the non-material, the tangible and intangible, aspects of life in rural communities.

The interveners, although recognizing that this Board is not responsible for compensation, suggested that there was a need for improvement in the compensation provided for well sites and access roads. In their view, the current compensation settlements reflect a reasonable value for the land taken out of production, but do not provide adequate compensation for the other inconveniences associated with the intrusion of a foreign industry into a rural setting.

Another major concern of the farmers was the effect of high density oil well development on their environment. Air pollution, as a result of gases released from wells and storage tanks, would create a hazard to plant, animal and human life forms living in the immediate area. Potential water pollution problems created by the release of drilling fluids, oil and salt water spills from wells and pipelines was also a concern to the interveners.

The interveners were also concerned about the adverse effects cattlemen would face with oil wells located in pasture lands. The additional stress caused by increased traffic noise would likely result in decreased beef production, calving problems and losses, and a loss in milk production. Increased stress associated with traffic noise, dust problems, foreign materials on well sites and in water supply sources would all lead to a higher incidence of cattle disease and death. In addition, extra manpower would be required to provide the extra control and surveillance required to maintain the herds. In summary, the interveners contended that each individual well site increased cattle operation costs by $3 745 per year. This figure was determined based on an estimation of the costs associated with increased theft; stress on the animals; extra manpower; increased medication for sick and crippled animals and the loss of forage production based on a 4-acre (1.6-ha) well site.

5.3 Views of the Board

The Board notes that none of the interveners specifically objected to Dome's application for 40-acre (16-ha) well spacing and that their primary objections were directed to the surface location of wells (ie. target areas). The interveners did however, express considerable concern respecting the impact on farming operations of an increase in well density and thus the number of wells. The Board will decide on the 40-acre (16-ha) spacing aspect of the application by weighing these increased impacts against the benefits which would result from reduced spacing.

Although the Board has not carried out detailed studies to confirm the expected magnitude of the increase in primary oil recovery associated with a reduction in well spacing from 160-acre (64-ha) to 40-acre (16-ha) in the Lindbergh Area, the Board is satisfied that 40-acre (16-ha) spacing will definitely improve recovery efficiency. Evidence submitted by Dome suggests the improved recovery could be in excess of 100 000 barrels per quarter section. The Board considers this a distinct possibility in areas where 40-acre (16-ha) development would be justified. Indeed, production history from other heavy oil areas such as Lloydminster and Wainwright has confirmed that primary recovery is economically viable only on less than 160-acre (64-ha) well spacing.

The Board also recognizes that, due to the variable nature both in thickness and areal extent, of the hydrocarbon resource in the area, 40-acre (16-ha) well spacing would improve the exploration and delineation phases of Dome's project. More than one well per quarter section is required to enable the operator to formulate sound development plans.

With respect to the impact on farming operations there is little doubt that four wells per quarter section would have greater impact than would one. This would occur not only through direct loss in land cultivated but also through greater nuisance and impact on the efficiency of the farming operation. The Board has reviewed the evidence submitted at the hearing and notes that the Elk Point Group's estimate of the cost of the impact of some $15 000 per year per quarter section is about 10 times as great as the estimate made by Dome. The Board believes the actual impact, in dollar terms, will vary greatly for different well sites, depending on the agricultural use to which the land is subjected; the ability in the siting of wells and access roads to take advantage of road allowances, fencelines and obstacles in fields; the size of farm equipment; the placing of wellsite powerlines underground; and other matters. The Board believes the estimate made by the Elk Point Group reflects the maximum impact possible and consequently is an overestimate of what the actual impact of an average well would be.

The Board is aware that as the number of wells drilled per section of land increases, the risk and/or potential for increased environmental problems associated with oil field drilling, production and transportation also increases. The Board is satisfied, however, that sufficient legislation is in place to minimize the magnitude of any problem situations and to control the situation once it occurs. Staff from the Board's Wainwright Area Office make regular inspections of the facilities in oil field operations to ensure compliance with the Board's and other government acts and regulations and initiate remedial action where required. In addition, the Board has an answering service to provide 24 hour service to respond to pollution complaints and other problems of concern to the public.

In summary the Board believes the potential benefits and impacts associated with one legal subdivision spacing in the area are as follows:

(a) Benefits

- Exploration flexibility, to allow for the orderly and effective delineation of the known oil accumulations.
- Considerably increased oil recovery under primary methods.
- An increase in the economy of the area through increased lease rentals, additional men and equipment working in the area and additional employment opportunities for area residents.

(b) Impacts

- Loss to the agricultural land base via acreage required for well sites and access roads.
- An increase in the cost and ineffiencies in the farming operations associated with manoeuvering large farming equipment around additional obstacles.
- An increase in the nuisance effects.
- An increase in the potential for environmental impacts.
- Possible social impacts associated with the rapid economic growth of the area and with the transient population which will frequent the area during peak construction periods.

Although the Board recognizes that increasing the density of wells in a given section or area may increase minor short term problems associated with normal oil field activities, it is satisfied that these potential problems do not outweigh the need for 40-acre (16-ha) well spacing. In particular, the Board notes that the incremental oil which could be recovered and the related economic growth in the local area has a much greater public benefit than the costs of any necessary impacts on agricultural operations. Accordingly, the Board sees no reason to deny Dome's application for 40-acre (16-ha) well spacing. It will be dealing with the question of target areas in the next section of the report.

6.0 THE APPROPRIATE TARGET AREA

6.1 Views of Dome

In its original submission Dome requested that target areas for the 40-acre (16-ha) drilling spacing units be designated as the entire south-east quarter of each legal subdivision. At the hearing, Dome indicated that it was not its intention that the target area should be the entire 10-acre (4-ha) of the south-east quadrant of each legal subdivision but rather just the normal 2.5-acre (1-ha) target area, centrally located in the south-east quadrant of the LSD, which was allowed in the other 10-acre (4-ha) developments in the Province and which was recommended in the Board staff submission to Proceeding No. 810132 (See Figure 4). Dome did not provide any evidence to support the specific need for this small, centrally located target area, however, it did indicate a preference for the Board staff recommendation because the first well in each LSD would then be on pattern in the event that 40-acre (16-ha) well spacing was later reduced to 10-acre (4-ha) spacing.

Dome did not agree with the Board staff recommendation to restrict the target area for a normal one quarter section drilling spacing unit to a 2.5-acre (1-ha) area of the south-east quadrant of Legal Subdivisions 1, 3, 9 and 11 (See Figure 4). It was Dome's view that these target areas would not allow the oil industry sufficient flexibility to develop heavy oil, considering the rapidly changing thickness of the channel and deltaic sands present in the Lindbergh Area. Dome contended that if an operator could show geologically that another legal subdivision, say LSD 7, was a preferable location that the ERCB should allow drilling in the south-east quadrant of LSD 7 instead of the south-east quadrant of LSD 1.

Dome contended that the Highway 14 East Surface Rights Group's proposal to establish a limit of four drilling sites per quarter section, one in the centre of each LSD, was unrealistic because it would likely require the drilling of five wells per legal subdivision instead of four in order to efficiently carry out a tertiary recovery project.

Dome also stated that the Unifarm proposal was unrealistic because all wells including the first well in every quarter section would have to be directionally drilled in order to be on target for subsequent developments. To start in with directional drilling at the exploration stage, even before a discovery was made, was completely unacceptable in Dome's view.

Although Dome did not comment specifically on the Elk Point Groups or the other interveners target area proposals, Dome contended that the proposals, in general, were unacceptable due to the directional drilling aspects. Dome stated that the technical and economic limit for directional drilling in this area was a lateral deviation of 660 feet (200 m). Consequently, as the interveners directional proposals required lateral extensions beyond 660 feet (200 m), Dome contended that the proposals could not be either economically or technically justified.

Dome stated that it would cost $50-60 000 over and above the normal vertical drilling costs, to drill a directional hole that would result in a lateral deviation of 660 feet (200 m). In Dome's view it would cost an additional $40-$50 000 to increase the lateral displacement a further 100-200 feet (30-60 m). Furthermore, operating costs would be approximately 20 per cent higher for a directional well as compared to a vertical well.

In Dome's opinion the technical aspects also weigh very heavily against directional drilling. The risk of "losing" a well during drilling would be much higher for a directional well because the chances of sticking the drill string are much higher; especially once the hole angle exceeds 45 degrees from vertical.

Rod fall and pumps sanding in are two operating problems that are unique to the producing of heavy oil. Due to the thickness of the oil in the tubing, the rods don't fall very readily and/or don't fall the entire stroke length of the pump which results in a reduction in the efficiency of the pump, and hence the oil recovery. This problem is much greater in directional wells because there is a lot more friction in the directional well.

Sand tends to enter the perforations during normal production operations; to build up around the tubing and eventually stick the pump. To remedy this problem it is necessary to pull the tubing and the rods from the hole and then remove the sand. In Dome's view this operation would be extremely difficult, if not impossible, in a directional well.

In summary, Dome contended that directional drilling for primary development was clearly not technically or economically feasible and would result in the elimination of one-third of the primary prospects in the area.

6.2 Views of the Interveners

6.2.1 Elk Point Surface Rights Assocation

The Elk Point Group stated that the Board staff proposal for a small 2.5-acre (1-ha) target area with sides 164 feet (50 metres) from the perimeter of the LSD for quarter section spacing (Dome's amended target area request) was too rigid and inflexible. This group contended that with the target area being so small, there could be serious problems with farmyards, farm dwellings and other improvements, most of which are located at corners of quarter sections. The Elk Point Group stated that designating a target area comprised of the entire south-east quadrant (10-acres or 4-ha) would provide much more flexibility in the locating of wells and thereby reduce the negative impacts on the agricultural industry.

This organization also contended that the 164 foot (50 metre) set back distance between the well head and the road allowance should be reviewed. It believed that in many cases a set back of this magnitude was not warranted and therefore the Board should recommend to municipalities that this requirement be removed for the benefit of increased flexibility in locating well sites. The Elk Point Group agreed with the concept of maintaining a uniform target area pattern (ie. subsurface target area in the south-east quadrant of each LSD for 40-acre or 16-ha well spacing), however, it suggested that there were two alternatives for actual wellhead or surface locations for the wells. In its view, these alternatives would reduce the negative impacts on the agricultural industry and the community life to acceptable limits; ensure the maintenance of oil conservation, equity and correlative rights which are of concern to the mineral rights owners; and at the same time result in only a modest increase in costs to the oil companies.

Under one proposal, this group suggested the establishment of one pad or surface location every 80 acres (32-ha), from which the wells would be directionally drilled to the subsurface target areas (See Figure 5). This approach would result in only 13 well sites for every two sections rather than the 32 well sites required with vertical drilling. This proposal would result in a 50 per cent reduction in the loss of arable land and in the least interference to the agricultural industry within the limits of present technology.

The Elk Point Group was aware that the above mentioned proposal would have a severe economic impact on the oil industry and consequently suggested a second alternative. Under this proposal vertical wells would be drilled from within a surface and subsurface target area located in the south-east quadrant of LSDs 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 14 and 16. For LSDs 5, 7, 13 and 15, the subsurface target area would remain in the south-east quadrant of these LSDs, however, the surface location for the well would be shifted to the south-west quadrant of the LSD if the move was requested by the surface owner. These wells would then have to be directionally drilled to the subsurface target area (See Figure 6).

The Elk Point Group contended that this proposal offered a high degree of flexibility for negotiating well sites. In its view, this proposal would have few negative impacts on the agricultural industry as roads would be held to a minimum and be adjacent to quarter section lines or natural perimeters. In addition its proposal makes only modest demands for less than 25 per cent of the wells would have to be directionally drilled. The Group contended that, taking into consideration the natural obstacles and the fact that there are trade-offs in directional drilling, the overall cost might increase somewhere in the order of only 10 to 20 per cent.

To support its position, this group carried out a quantitative comparison of the negative impacts of centrally located wells (per quarter section) versus the perimeter wells outlined in their primary alternative. This study indicated that on the basis of 40-acre (16-ha) well spacing, centrally located wells would increase the farming costs by approximately $4 000/quarter over the perimeter wells. In the case of pasture lands the costs would be increased by approximately $6 700/quarter. The Elk Point Group also contended that there were a number of additional effects, such as extra wear on equipment, extra pulverization and compaction of headlands; reduction in grain-combining efficiency and increased hauling distances which cannot be quantified but which must be considered when evaluating the overall impact of oil and gas activities on farming operations.

In summary the Elk Point Group stated that it was putting forward these two alternative proposals for the Board's consideration in good faith, believing that such proposals were viable and feasible for the oil producers to implement in the Lindbergh field and would greatly reduce the negative impacts on the farming industry and community.

6.2.2 Highway 14 East Surface Rights Group

The Highway 14 Group proposed that the Board establish no more than 4 drilling sites (pads) per quarter section centrally located in each LSD (See Figure 7). This group contended that this would facilitate directional drilling from each one of these pads to enable however many wells that were necessary for enhanced recovery techniques. It contended that four wells per quarter was the economic threshold of density for oil wells beyond which it became uneconomic to farm around the wells.

The Highway 14 Group also endorsed the Elk Point Group proposal to restrict the surface locations for the wells to the perimeters of the fields.

This group did not provide any evidence or position with respect to the Board staff proposed target area for quarter section spacing.

6.2.3 North East Alberta Protective Rights Assocation

The North East Alberta Group did not put forward a proposal regarding the target areas for 40-acre (16 ha) well spacing, however, it did endorse the Elk Point Group's proposal to restrict the well sites to the fence lines and as close to the corners of the fields as possible.

This group's major concerns related to the impact of 64 wells per section (10-acre well spacing) rather than 40-acre (16-ha) spacing.

The North East Alberta Group was concerned about well site and pipeline right-of-way reclamation practices and the level of compensation paid for these sites. The majority of its presentation concerned these two items.

This group did not object to the Board staff proposal for target areas except as it related to the 164 foot (50 metre) set back distance. It contended that it would be impractical to farm that small isolated area efficiently and therefore there could be a severe weed problem. It contended that the target area should be moved closer to the fence line.

6.2.4 North East Alberta Branch of The Alberta Institute of Argologists

The AIA recommended two alternatives for reducing the impact of reduced well spacing on the agricultural industry. This group did not object to the location of the subsurface target areas but to the surface location of the wells required to develop the area on the basis of those subsurface target areas.

Under its primary proposal, the AIA recommended that the number of drilling pads be limited to 1 per 160 acres (64-ha) (See Figure 8). These drilling pads would be located adjacent to quarter section boundaries to further reduce the impact on farming operations. It suggested that it should be technologically possible to develop whatever subsurface spacing was required using directional drilling from these pads.

As a second alternative, the AIA recommended that for 40-acre (16-ha) well spacing, drilling be permitted in the fence line corners of LSDs 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 14 and 16. However, somewhat similar to the Elk Point Group, it recommended that LSDs 5, 7, 13 and 15 should be drilled directionally from the adjacent LSD (See Figure 9).

The AIA's primary concerns were the amount of arable land taken out of production and the negative impact on efficient and economic farming operations. In summary it stated it was important to give the highest consideration to the impact on agriculture. Its position was that maximum conservation of arable and potentially arable lands must be achieved and that well sites should be located in such a manner so as to minimize interference to present and future farming operations. In its view, its proposals would accomplish these goals.

The AIA supported the Board staff proposal to shift the quarter section drilling spacing unit target area to the south-east quadrant of LSDs 1, 3, 9 and 11.

6.2.5 Westmin Resources Ltd.

Westmin Resources Ltd. supported the application of Dome Petroleum Ltd.

6.3 Views of the Board

6.3.1 Size of the Target Area

The Board notes that the target area size for a normal 40-acre (16-ha) drilling spacing unit is 10-acres (4-ha) and that this size was adopted because well spacing or inter-well distances were not normally critical under 40-acre (16-ha) development. The large target area therefore allows a great deal of flexibility in the locating of a well bore. On the other hand, the same flexibility can result in some irregularity in well patterns with a related impact on equity and ultimate recovery of the oil.

The Board is aware that any decision which would adopt a very small and thus restrictive target area could have a significant impact on the co-existent farming operations. The Board agrees with the interveners that any decision must have regard for the negative impacts on the agricultural industry and that it should minimize these impacts as far as possible. Consequently, the decision on the size of target area involves weighing the advantages to the agricultural community of the flexibility of a larger target area against the disadvantages to the subsurface mineral owners and the public interest in terms of potential equity and conservation problems.

The Board notes that the applicant did not provide significant evidence to support the need for a restrictive target area size as it relates to 40-acre (16-ha) well spacing. The Board is of the view that for the areas and pools in question and under primary recovery on 40-acre (16-ha) spacing, a precisely regular well pattern with consistent inter-well distances is not critical. In this case, neither equity nor conservation problems would be substantial due to the nature of the reservoir and the fluid and the relatively limited area which would be economically drained under primary recovery practices.

The Board is aware, however, that the well spacing adopted at this stage of development might have an impact on subsequent developments, particularly under tertiary recovery at 20-, 10- or 5-acre (8-, 4- or 2-ha) well spacing. The importance of maintaining a completely uniform well grid pattern with closer spacing could only be determined after extensive consideration of detailed geological, geotechnical and reservoir engineering factors that determine the nature and efficiency of inter-well drainage for a given type of recovery operation. As a generalization, however, uniform well spacing, whether uniformly square or uniformly oblong, would be more important under closer spacing.

If the Board was of the view that essentially all of the area of application was likely to be developed on a dense pattern such as 10-acre (4-ha), it would have requested evidence at the hearing respecting the appropriate size of target areas for smaller spacing units. However, the evidence from Dome at the hearing suggested that only a small fraction of the lands in question, less than 5 per cent according to Dome, would eventually be subject to spacing in the order of 10-acre (4-ha). While the Board recognizes the uncertainties in predicting what portion of the lands in question will be developed on dense spacing and also the unique types of well patterns that might be needed, it accepts Dome's opinions in this respect to be as good an estimate as is possible at this time.

In summary with respect to the size of target areas for the lands where 40-acre (16-ha) spacing is to be adopted, the Board concludes as follows:

- A 10-acre (4-ha) target area would assist the agricultural community by providing greater flexibility in the locating of wells.
- A 10-acre (4-ha) target area would not result in well spacing so irregular as to cause substantial equity or conservation problems.

- Not all of the area in question would likely be developed on 40-acre (16-ha) spacing.
- Only a small portion of the area would likely be developed on a spacing as dense as 10-acres (4-ha) where inter-well distances could become critical.

Bearing the above in mind the Board is not prepared to impose a smaller target area and rigid spacing along with its greater impact on the agricultural community on the full area of application when it might aid in oil conservation only for small localized areas. If the results of drilling the early "exploration-type" wells in a particular area suggests that the reserves are not amenable to 40-acre (16-ha) development for primary recovery purposes very few follow-up wells would likely be drilled in the immediate vicinity and no significant well siting problems should result. If on the other hand the initial "exploration" well or wells in a particular area suggest that 40-acre (16-ha) primary development is feasible but that tertiary development with the related denser spacing cannot be expected, then 40-acre (16-ha) drilling can continue and, as stated earlier, a highly uniform spacing pattern is not essential. In these instances some additional flexibility can be exercised in locating wells to accommodate landowner's wishes.

The Board recognizes that in the limited, local portions of the Lindbergh Area where initial drilling suggests that dense follow-up drilling is likely, the flexibility to landowners regarding well locations will be more restricted. The Board believes landowners would be prepared to co-operate in meeting oil industry needs by giving up some flexibility in those local areas where development on highly dense spacing is likely recognizing the considerable flexibility that would be retained throughout the major portion of the total area of the application. Also should highly dense development take place, landowners in those local areas could expect to receive higher compensation proportionate to the land use and inconvenience caused by the much more intensive oil development activity.

The Board hopes that through improved communications and planning by the oil industry and land owners that most locations, even in areas where dense spacing may occur, will be decided by voluntary negotiations. Where this is not possible the Board will consider individual well locations at the time of applications for licences and will make its decision on the basis of the evidence relating to any particular case.

6.3.2 Location of the Target Area Within the 40-acre (16-ha) DSU

In considering the location of the 10-acre (4-ha) target area within a 40-acre (16-ha) spacing unit, the Board will first look at the question of subsurface target areas. It will then consider whether some different surface target area would be desirable and practical. The latter involves, in particular, an evaluation of the merits of directional drilling.

As stated earlier, completely uniform well spacing is not essential to maximum recovery of the heavy oil in question when developed on 40-acre (16-ha) spacing. However, if the spacing of wells is not reasonably uniform the impact on ultimate recovery or on drainage from one owner's lands to another, could be substantial. Additionally, a considerable disregard for uniformity in drilling wells on 40-acre (16-ha) spacing would probably have adverse economic and oil conservation effects for subsequent tertiary recovery operations, involving dense well spacing.

The Board agrees that a corner or fence line target area is clearly preferable with respect to impact on the surface and notes that both Dome and the farm groups agreed on this point. The Board notes, that if the 10-acre (4-ha) target area is located in the south-east corner of the 40-acre (16-ha) spacing unit, as is illustrated in Figure 2, a possible quarter-section line location for wells would result in LSDs 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 14 and 16. The resulting spacing would be uniform and thus desirable from an equity and conservation viewpoint. The Elk Point Group acknowledged this and did not strongly oppose the location of the target areas for these three quadrants of each quarter section. The only area that was disputed was the target area for wells to be drilled in the north-west 40-acre (16-ha) DSU of each quarter section.

If the 10-acre (16-ha) subsurface target area for the north-west 40-acre (16-ha) DSU is to be located such as to be on a quarter section line, it would have to be on the west or north extremity of the 40-acre (16-ha) spacing unit. Irrespective of the site selected, the well to be drilled would be very near to a well in an adjacent drilling spacing unit. The effect would be a two-well cluster and a large inter-well drainage area for the north-west DSU.

The evidence provided by Dome to the hearing, permits some assessment of the impact on primary oil recovery. Based on this information, the Board believes that such two-well clustering would usually be considered very inefficient and a well would not be drilled in the north-west 40-acre (16-ha) DSU. The result would appear to be to reduce primary oil recovery to a level of 4 per cent (215 000 barrels) per quarter section, giving a conservation loss of 1 per cent (some 55 000 barrels) for the typical Lindbergh case. In the unlikely event that the well was drilled along a fence line in the north-west DSU, the primary recovery level would not likely be more than 4.3 per cent per quarter section giving a conservation loss of about 40 000 barrels compared to a fully uniform 40-acre (16-ha) well spacing array.

In summary, oil conservation losses by primary recovery would be at least 0.7 per cent of the oil-in-place (40 000 barrels) and more likely 1.0 per cent (55 000 barrels), if the specified subsurface target was anything other than the conforming south-east 10-acre (4 ha) of the north-west 40-acre (16-ha) DSUs.

With respect to the surface location of target areas, as mentioned earlier, the Board notes that the 10-acre (4-ha) target areas in the south-east quadrant would allow a quarter section line location for all but the north-west 40-acre (16-ha) of the quarter section. The Board thus believes the surface locations of the target areas for LSDs 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 14 and 16 should be the same as the subsurface location as shown in Figure 2.

As observed in the Interim Decision report, the principal issue was the locating of surface vis a vis subsurface targets for wells to be drilled in the north-west 40-acre (16-ha) DSU. Thus with respect to LSDs 5, 7, 13 and 15 the Board believes that there are two principal alternatives to avoiding the oil conservation losses that might otherwise occur. One involves a surface target area the same as the subsurface target and the drilling of a vertical well from a location in the south-east quadrant. The second would entail the drilling of a directional well from a fence line location in the south-west or north-west quadrant of the legal subdivision back to a subsurface target area in the south-east quadrant. In reaching a conclusion respecting the most appropriate alternative, the Board believes that it must have regard for the solution that results in the least overall impact to both the agricultural and oil industries in this area.

The Board has reviewed the evidence presented at the hearing respecting the impacts and/or costs of the two alternatives and summarizes its findings as follows:

	Vertical Well SE Quadrant	Directional Well SW Quadrant
Increased Drilling Costs to Oil Industry	Nil	$50-$100 000
Increased Operating Costs to Oil Industry		20% higher/year
Increased Operating Costs & Crop Losses to Agricultural Industry	$1 200/year* (principal impact derives from access roads)	
Increased Operating Costs & Losses to a Pasturing Operation	$1 700/year*	
Non Quantifiable Impacts on either Oil or Agriculture Industries	o Extra wear on farm equipment	o Increases risks during drilling & completion

Vertical Well SE Quadrant	Directional Well SW Quadrant
o Addition pulverization and compaction of headlands and resulting crop losses	o Uncertainties regarding the actual technical feasibility of producing a directional well under primary production
o Reduction in grain combining efficiency	
o Longer hauling times due to increased interference from access roads	
o Additional stresses on agricultural workers	

* Specific figures were not provided for the cases involving 4 wells in the SE quadrants vs 3 wells in the SE quadrants and 1 well in the SW quadrant, however, the Board believes as a result of a detailed review of the evidence presented by the Elk Point Group that these numbers represent realistic maximums for the placement of the well near the centre of the quarter section and that it would be appropriate to use these figures in its analysis of the alternatives.

It is clear to the Board that the direct costs to the oil industry for any proposal involving directional drilling for a primary recovery operation would be very significant and may not, in fact, be economically justifiable based on the lack of any confirmed, long term production history for the area. The added uncertainties associated with the dry hole potential during the exploration and delineation phase, make the economics even more pessimistic. the Board agrees with Dome that the operational costs for a directional well will be at least 20 per cent higher than for a vertical well and, in fact, it believes that the costs could be significantly higher than that. The Board recognizes that numerous references were made to successful operations, at reasonable costs, utilizing directional wells in the Cold Lake Area. However, the Board notes that these projects all involve some form of enhanced recovery scheme where the bitumen is heated up in order to produce it.

The Lindbergh project proposed under the Dome application would only involve, in the most part, primary recovery operations or in other words the pumping of cold heavy oil. There is little production history available respecting primary production operations of directional wells producing cold heavy oil and in this respect the Board shares Dome's reservations about the technical feasibility of achieving sustained production from a directional well under cold pumping operations.

The Board believes that the net result would be to make the number quoted above for increased costs for directional drilling minimum values and that the costs are more likely to be much higher, particularly respecting the increase in yearly operating costs.

In respect to the impact on the agricultural industry, the Board notes that although the cost figures presented by the farming groups, specifically the Elk Point Group, do not reflect a direct comparison of the perimeter drilling proposal as opposed to the 4 wells in the south-east quadrants, it is satisfied that the costs represent a realistic evaluation of the maximum impact on the agricultural industry. The Board has therefore utilized these values in its analysis of the two alternatives.

Having regard for the above mentioned points the Board believes that economic impact on the oil industry of a directionally drilled well would be far greater than the impact on the agricultural industry of a vertically drilled well. The Board notes that the increased costs associated with farming operations, being essentially those caused by the access road, should be accommodated by the initial lease payment plus the annual rentals.

In light of the foregoing conclusions the Board has decided that it is most appropriate to approve a surface and subsurface target area comprised of the entire south-east quadrant of LSDs 5, 7, 13 and 15 for the lands included in the Dome application. This is the same as the provisions for target areas approved for the other 40-acre (16-ha) DSUs in each quarter section.

The Board should point out that its decision respecting the surface location of target areas included a consideration of other configurations suggested by the Elk Point Group, the Highway 14 Group, and the AIA. These are illustrated in Figures 5, 7, 8 and 9. All of these proposals involved extensive directional drilling and for the "extra cost" and "risk" reasons set out earlier, were judged by the Board to be unacceptable from an overall public interest viewpoint.

6.3.3 Location and Size of Target Areas for 160-acre (64-ha) DSUs

With respect to the Board staff submission, the Board agrees that the target areas for the lands shown in Figure 1, but not subject to the Dome application, and thus still on quarter section spacing, should be consistent with the target areas for those lands where 40-acre (16-ha) spacing has been approved. Consequently, the target area for the lands in questions will be the 10-acre (4-ha) in the south-east corner of each quarter section as shown in Figure 3.

7.0 OTHER MATTERS NOT NECESSARILY IMPACTING ON THE DECISION BUT OF CONCERN TO THE BOARD

7.1 Negotiations For Surface Leases

Several of the interveners expressed a great deal of concern over the manner in which the negotiations for surface leases are carried out. They alleged that in many cases, a landman will come to the landowner with a proposal for a well site which he leads the landowner to believe is completely inflexible. In other words, the landman gives the landowner the impression that the proposed well site is the only possible location in the drilling spacing unit. In many instances, according to certain interveners, the landman, even if he knows that there may be some alternative sites, does not have the authority to approve any other location on behalf of the oil company and consequently he cannot really enter into any meaningful negotiations regarding location with the landowner.

The Board has heard this type of statement at several other hearings and is concerned that actions of this nature are increasing the difficulties in obtaining voluntary surface leases. The Board believes the oil companies have a responsibility in regards to carrying out meaningful negotiations with the surface rights owner respecting a well location.

In addition, the Board believes that oil companies are not giving sufficient consideration to the use of the special drilling spacing unit provisions available under Section 4.030 of the Oil and Gas Conservation Regulations. This section of the regulations provides the oil company with increased flexibility in locating a well within a drilling spacing unit and should be considered in situations where geologic and ownership conditions do not restrict the location of the well and where a landower's wishes could be reasonably accommodated.

In summary, the Board believes that oil companies must make every effort to resolve well location matters prior to coming to the Board with a request for a hearing. The Board would expect the applicant for a well licence to demonstrate to the Board that it has taken all reasonable steps to resolve differences, prior to requesting the Board to proceed with the processing of the application.

7.2 Soil Conservation and Reclamation

The interveners expressed a number of concerns and presented expert testimony regarding soil conservation and reclamation from the time of initial construction to the time of final abandonment of both well sites and pipeline right-of-ways. The interveners contended that because soil rehabilitation is site specific much more attention must be directed towards developing and carefully supervising soil stripping and reclamation programs commencing with initial lease clearing operations. In fact, the interveners suggested that a reclamation plan should be required and in place before any work is carried out. The supervision of soil stripping and reclamation operations by a qualified soils management technican was also suggested.

The matter of soil conservation and reclamation is covered by The Land Surface Conservation and Reclamation Act and is the responsibility of the Land Conservation and Reclamation Council. The Board accepts that the problems raised are serious ones that can be solved and it intends to pass information provided by the interveners along to the Council along with relevant portions of the transcript including expert testimony provided at the hearing.

7.3 Minimum Setbacks From Roads and Other Surface Improvements

The Board is aware of the concerns expressed about setback provisions which restricts opportunities to drill near quarter-section boundaries and it agrees that it may be appropriate to allow some lesser distance where circumstances warrant it. The Board wishes to point out that this matter is already under consideration by the "Energy Resources Conservation Board-Advisory Committee on Agricultural Matters" chaired by Mr. E. R. Brushett, Manager of the Board's Environment Protection Department.

7.4 Public Information Meetings

Several of the interveners were concerned over the stresses created by the uncertainties as to the scope of the enhanced recovery projects and, in particular, to the locations that would be ultimately developed on greatly reduced spacing patterns (ie. 5-acre (2-ha) or 10-acre (4-ha) well spacing). The interveners contended that these concerns would only be eliminated or relieved if the oil companies were to hold regular information sessions, both prior to and at regular intervals during the project development, with the local residents and landowners.

The Board agrees that the local residents of the area should be kept informed respecting the general nature and effects of significant resource developments. Further in this respect, the Board requests that operators in the Lindbergh Area arrange timely public information meetings, at some appropriate location in the area. These information forums would be used to describe the progress of existing projects; to outline development plans for the following year or two and to exchange views respecting local impacts.

8.0 DECISION

After considering the evidence, the Board has decided:

a) to approve Dome's application for 40-acre (16-ha) oil well spacing, for the lands shown in Figure 1,

b) that the target area for 40-acre (16-ha) drilling spacing units shall be the full 10-acre (4-ha) area in the south-east quadrant of each spacing unit as shown in Figure 10, and

c) that the target area for the intervening lands shown in Figure 1, which are subject to 160-acre (64-ha) spacing for oil wells shall be the 10-acre (4-ha) area in the south-east corner of each quarter section as shown in Figure 3.

The Board will issue the necessary ammendments to Order No. SU 1085 (issued following the interim decision) to reflect the adoption of the south-east target area for the north-west quadrant of each quarter section approved for 40-acre (16-ha) spacing.

DATED at Calgary, Alberta, on 13 October 1981

GJ DeSorcy
G. J. DeSorcy, P.Eng.
Vice Chairman

C. J. Goodman
C. J. Goodman, P.Eng.

N Strom
N. A. Strom, P.Eng.

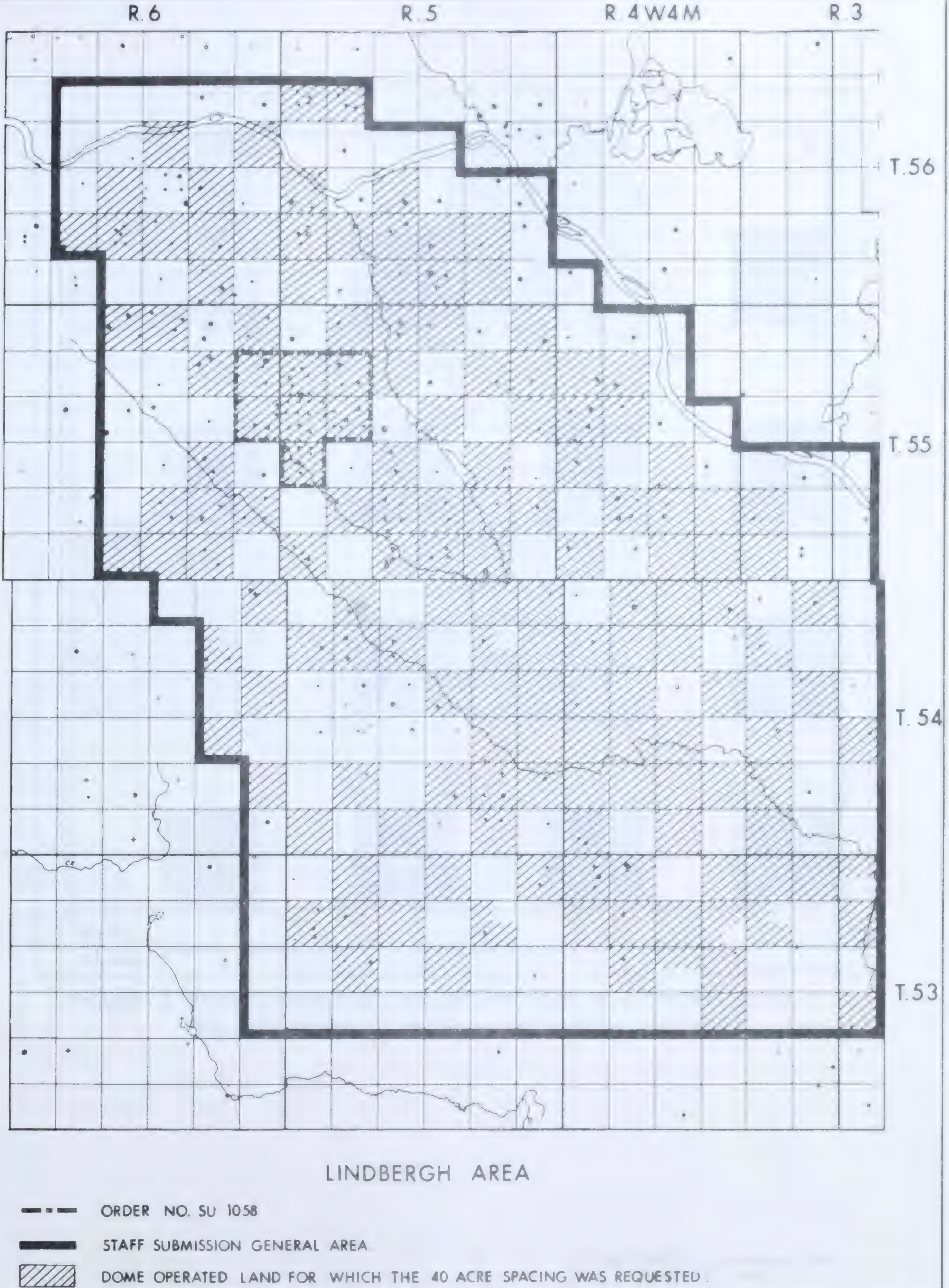
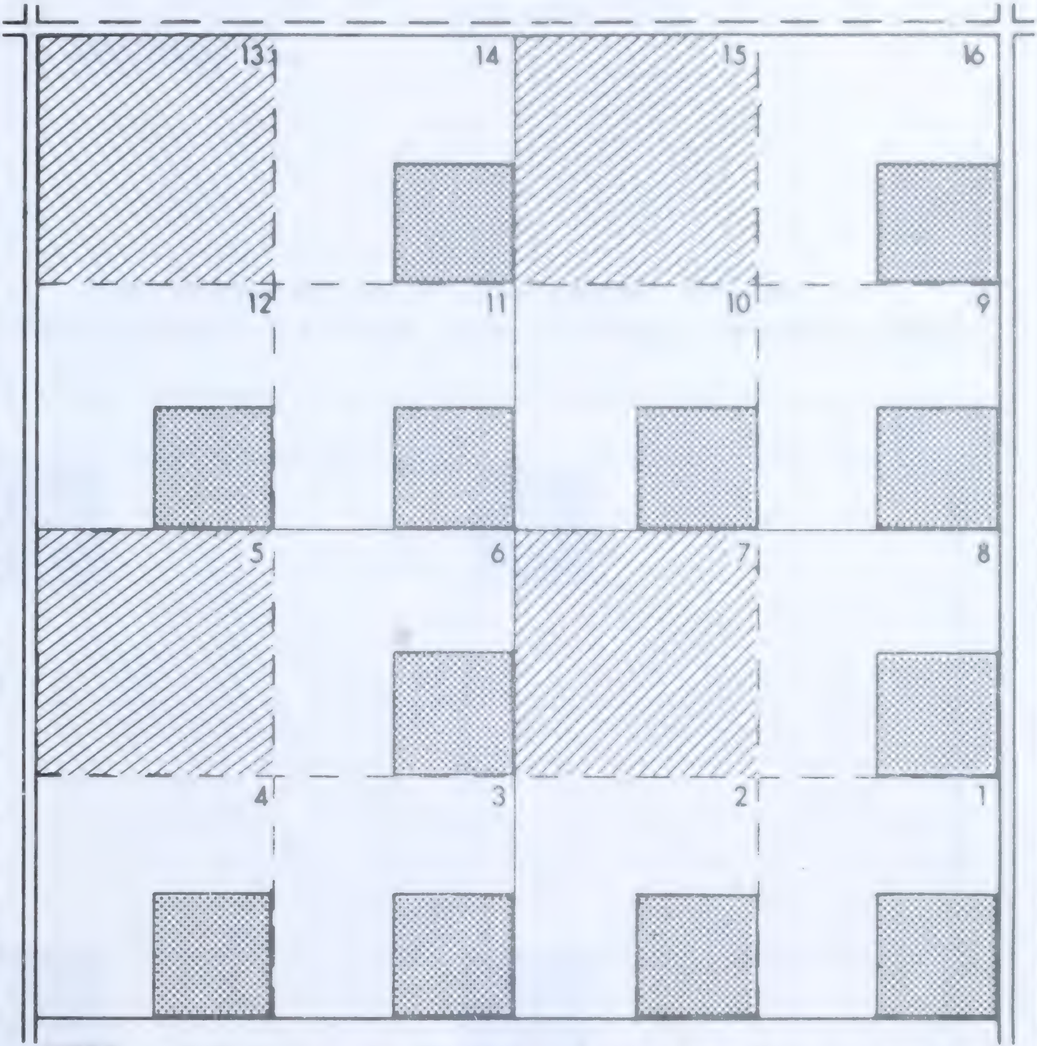

R.6
R.5
R.4W4M
R.3
T.56
T.55
T.54
T.53
LINDBERGH AREA
ORDER NO. SU 1058
STAFF SUBMISSION GENERAL AREA
DOME OPERATED LAND FOR WHICH THE 40 ACRE SPACING WAS REQUESTED

FIGURE 1 AREA OF APPLICATION

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA



▨ DRILLING SPACING UNITS FOR WHICH THE TARGET AREA DECISION HAS BEEN DEFERRED.

FIGURE 2 BOARD APPROVED TARGET AREAS FOR 40 ACRE (16 ha) DRILLING SPACING UNITS IN THE LINDBERGH AREA.

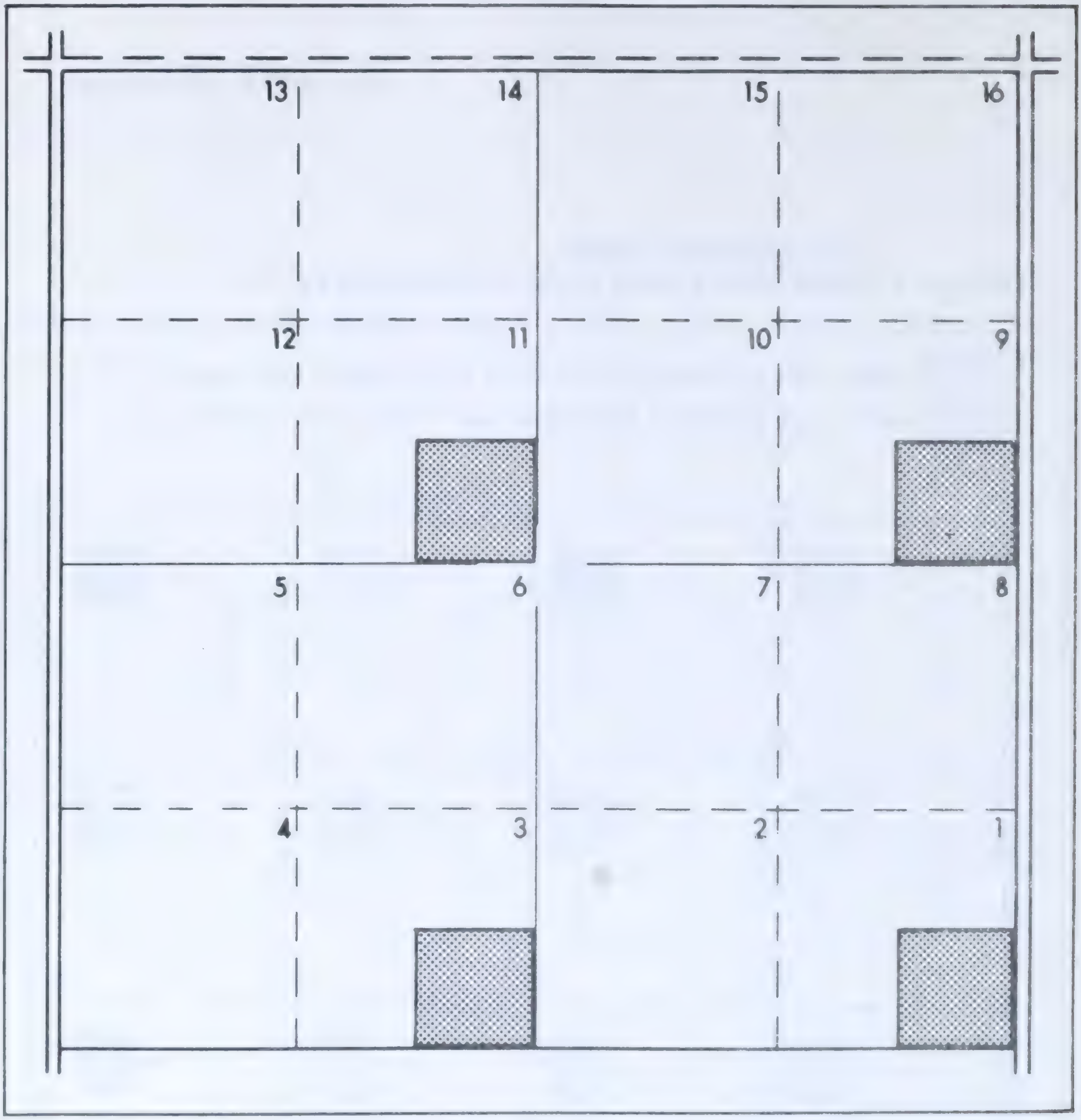
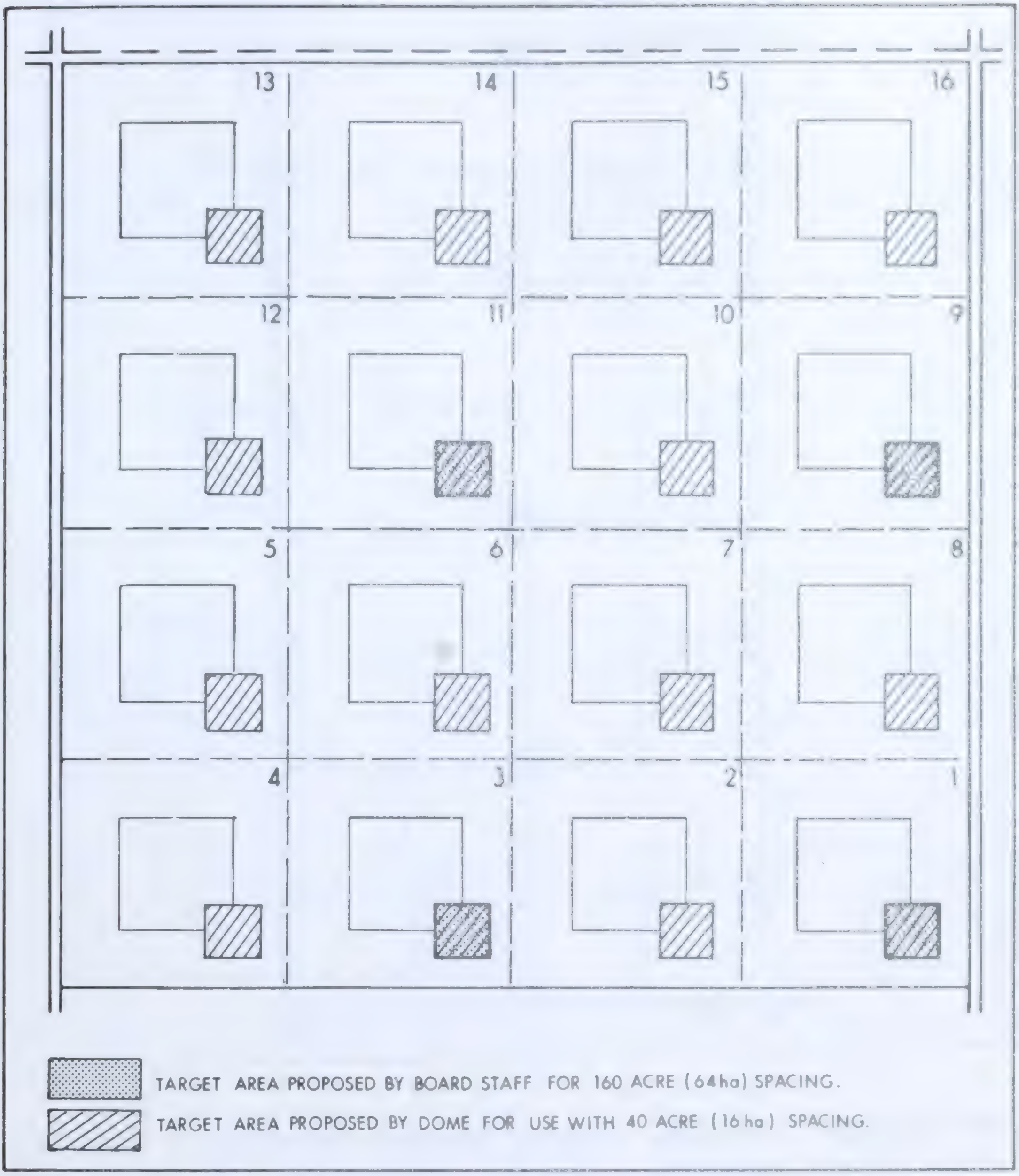


FIGURE 3 BOARD APPROVED TARGET AREAS FOR 160 ACRE (64ha) DRILLING SPACING UNITS IN THE LINDBERGH AREA.

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA


13
14
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16
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2
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TARGET AREA PROPOSED BY BOARD STAFF FOR 160 ACRE (64 ha) SPACING.
TARGET AREA PROPOSED BY DOME FOR USE WITH 40 ACRE (16 ha) SPACING.

FIGURE 4 DOME AND BOARD STAFF TARGET AREAS IN THE LINDBERGH AREA.

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

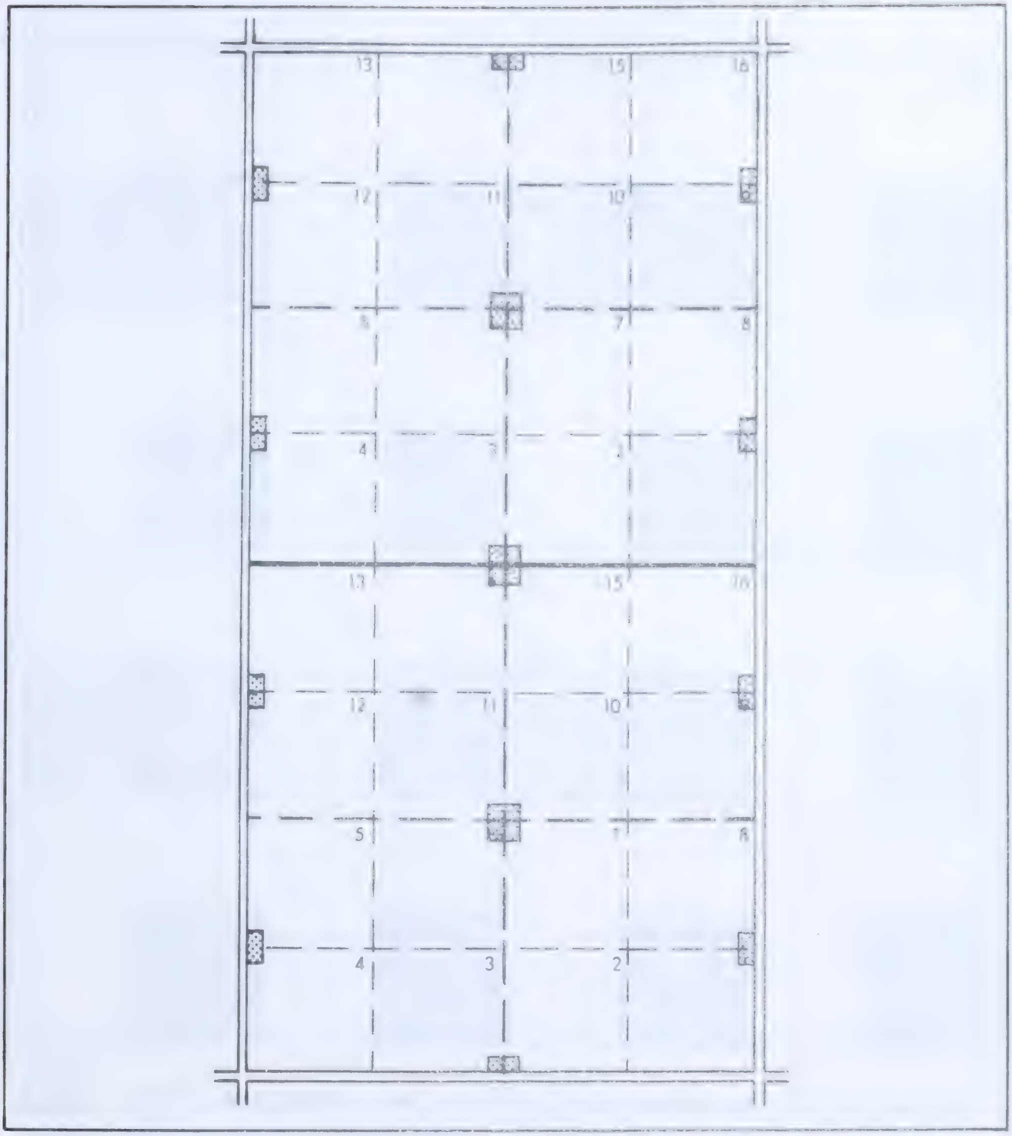
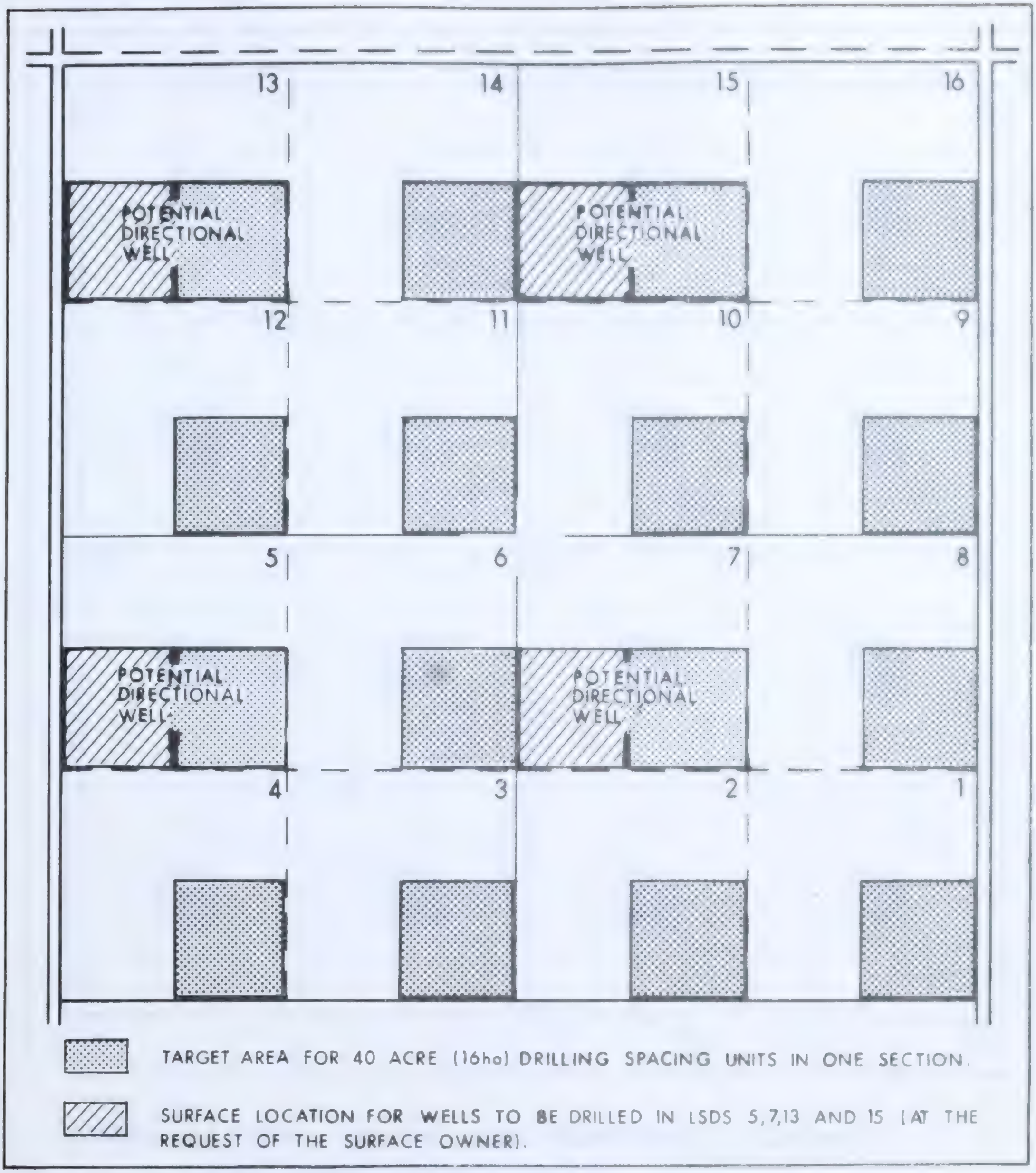


FIGURE 5 SECONDARY SURFACE DRILLING LOCATIONS PROPOSED BY ELK POINT SURFACE RIGHTS ASSOCIATION FOR 40 ACRE (16 ha) DRILLING SPACING UNITS.

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA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POTENTIAL DIRECTIONAL WELL
POTENTIAL DIRECTIONAL WELL
12
11
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POTENTIAL DIRECTIONAL WELL
POTENTIAL DIRECTIONAL WELL
4
3
2
1
TARGET AREA FOR 40 ACRE (16ha) DRILLING SPACING UNITS IN ONE SECTION.
SURFACE LOCATION FOR WELLS TO BE DRILLED IN LSDS 5,7,13 AND 15 (AT THE REQUEST OF THE SURFACE OWNER).

FIGURE 6 ELK POINT SURFACE RIGHTS ASSOCIATION PROPOSAL.

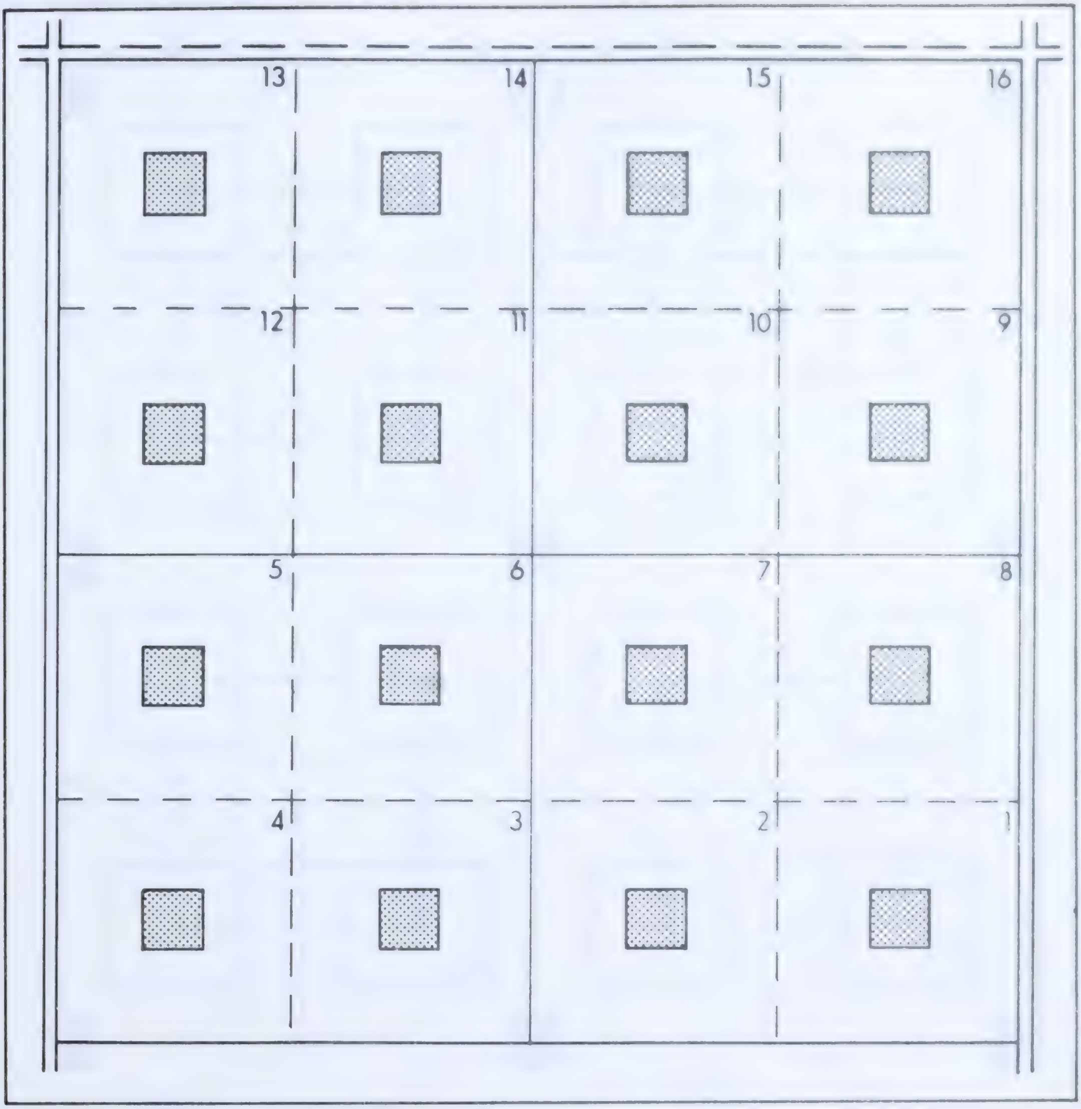


FIGURE 7 CENTRAL DRILLING PADS PROPOSED BY HIGHWAY 14 EAST SURFACE RIGHTS GROUP.

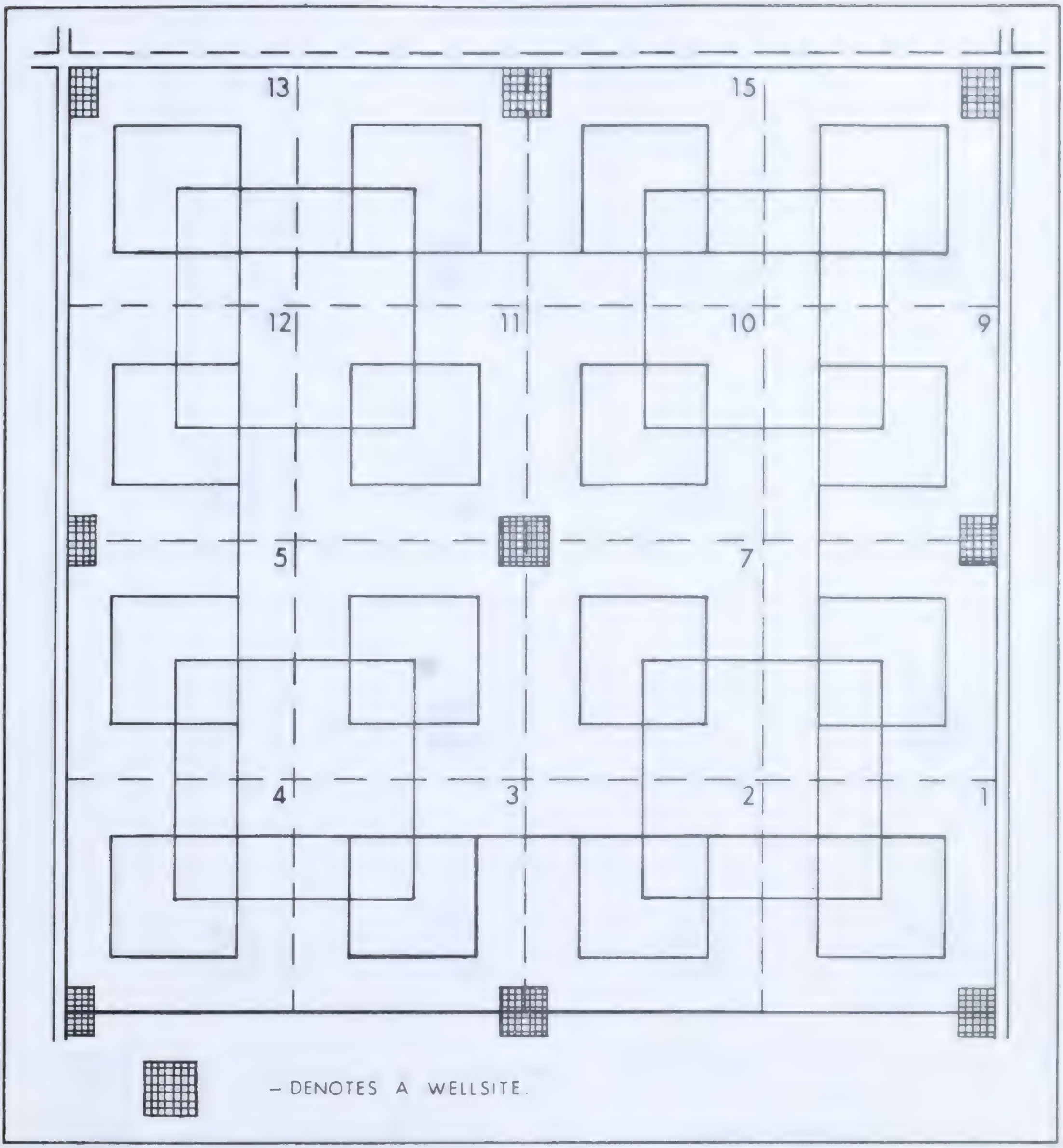
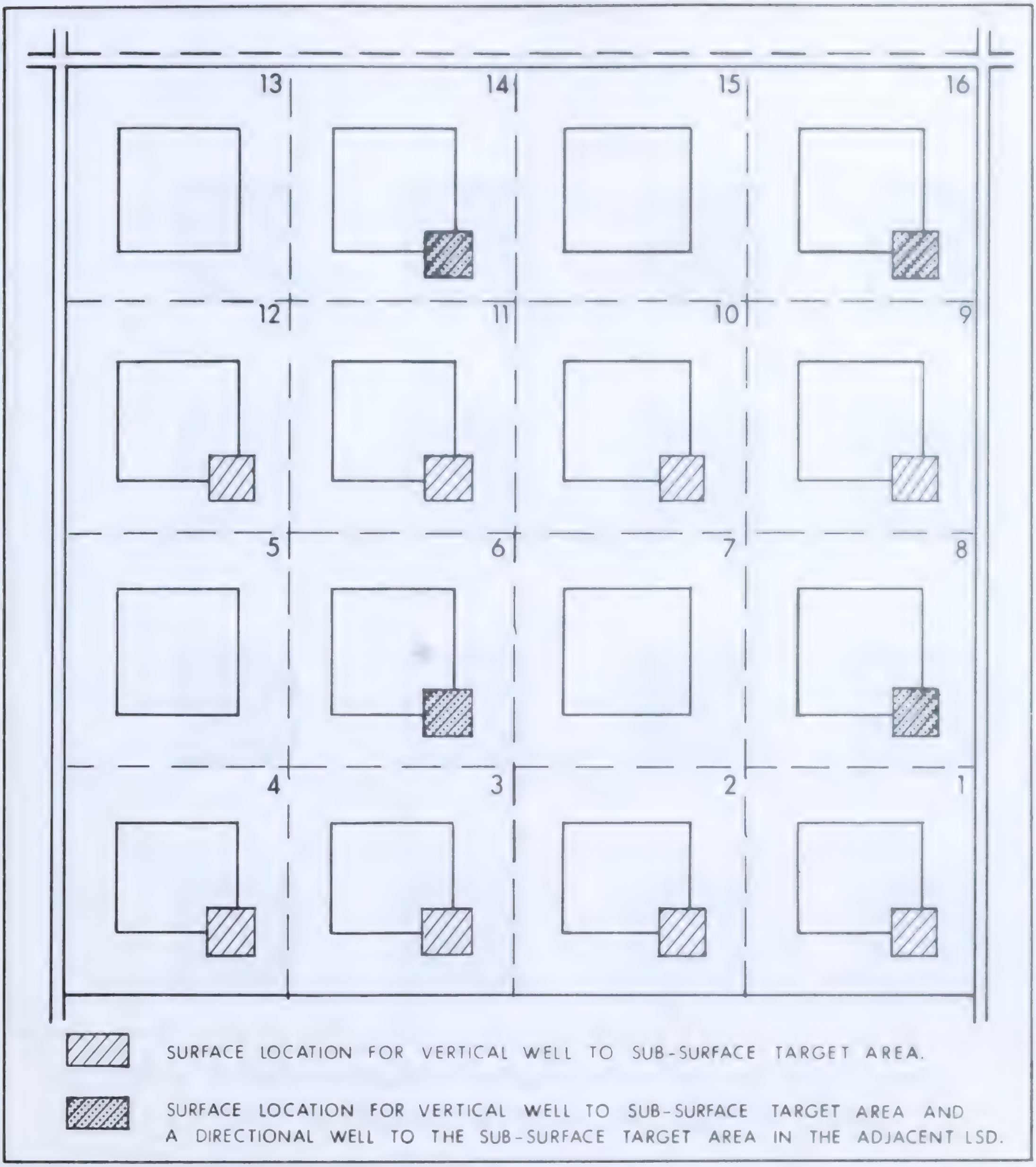


FIGURE 8 DRILLING PADS PROPOSED BY NORTH EAST ALBERTA BRANCH OF THE ALBERTA INSTITUTE OF AGROLOGISTS UNDER ALTERNATIVE 1.

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA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▨ SURFACE LOCATION FOR VERTICAL WELL TO SUB-SURFACE TARGET AREA.
▨ SURFACE LOCATION FOR VERTICAL WELL TO SUB-SURFACE TARGET AREA AND A DIRECTIONAL WELL TO THE SUB-SURFACE TARGET AREA IN THE ADJACENT LSD.

FIGURE 9 DRILLING LOCATIONS PROPOSED BY NORTH EAST ALBERTA BRANCH OF THE ALBERTA INSTITUTE OF AGROLOGISTS UNDER ALTERNATIVE 2.

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

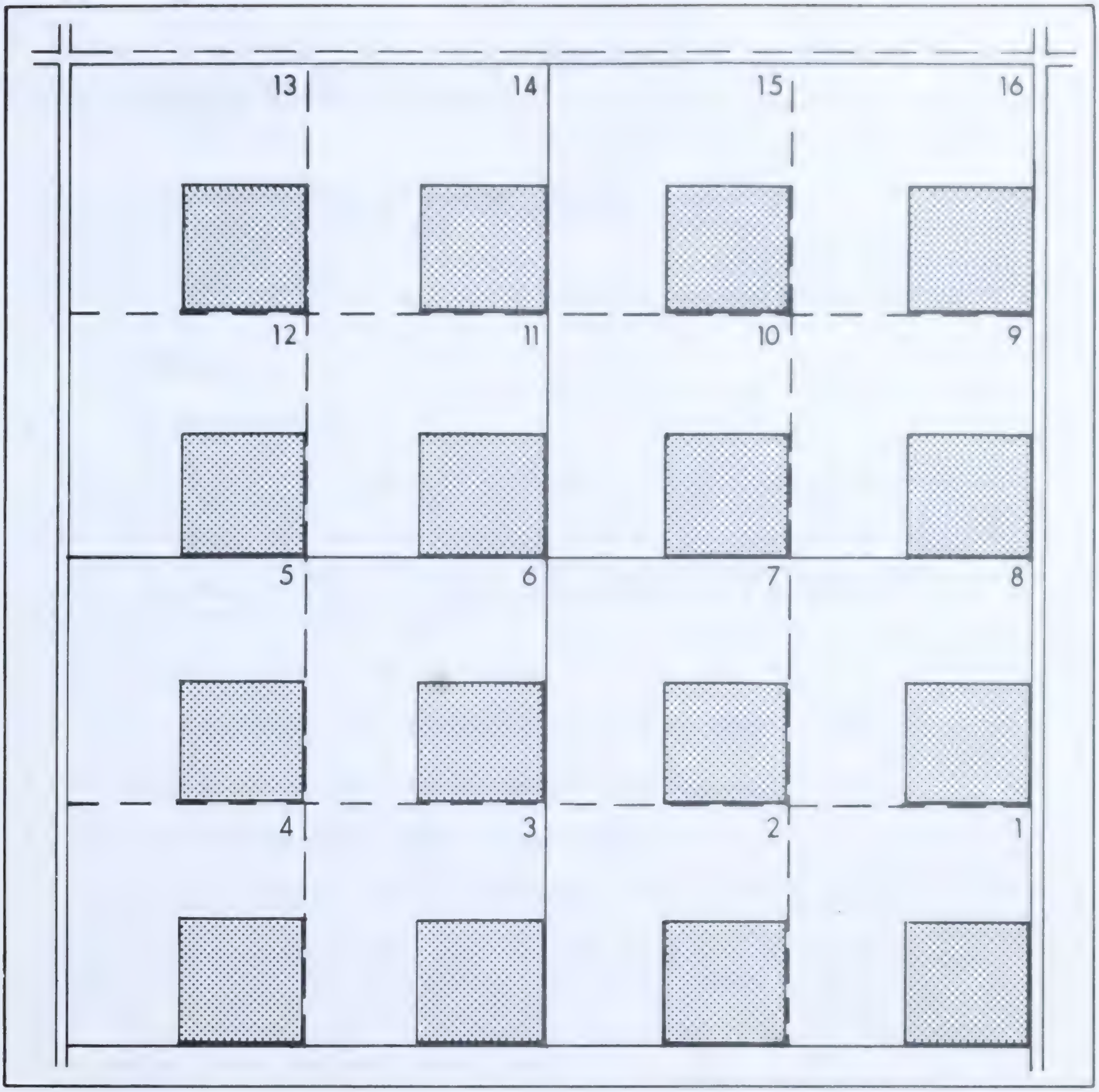

FIGURE 10 BOARD APPROVED TARGET AREA FOR 40 ACRE (16ha)
DRILLING SPACING UNITS IN THE LINDBERGH AREA

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

GOV
DOC
Admin
E56
Alta
36

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

CANADIAN WESTERN NATURAL GAS COMPANY LIMITED SECONDARY NATURAL GAS LINES AND REGULATOR FACILITIES CALGARY - PRIDDIS AREAS

Decision Report 81-27
Application 810487

1 INTRODUCTION

1.1 The Application

Canadian Western Natural Gas Company Limited (CWNG) applied pursuant to The Pipeline Act, 1975, to construct approximately 25 kilometres (km) of 406.4 millimeter (mm) outside diameter pipeline and associated regulating facilities to transport natural gas from an existing pipeline near Priddis operated by NOVA, An Alberta Corporation to a proposed regulator station in south Calgary.

CWNG proposed three alternative routes

- from Lsd 2-20-22-3 W5M (Alternate A) which is CWNG's preferred route,
- from Lsd 16-17-22-3 W5M (Alternative Route B), and
- from Lsd 3-16-22-3 W5M (Alternative Route C)

to the proposed regulator in Lsd 13-23-22-1 W5M, as shown on Figure 1.

A similar application by CWNG was heard by the Board in September 1980 but was denied because the applicant had not evaluated alternative routes nor presented sufficient evidence to support its applied-for route. The details of that decision are described in Energy Resources Conservation Board Decision Report 80-21.

1.2 The Hearing

A public hearing of the application was held before the Energy Resources Conservation Board on 8, 9, and 10 September 1981, in Calgary, Alberta, with V. E. Bohme, P. Eng., C. J. Goodman, P. Eng., and L. A. Bellows, P. Eng., sitting.

Those who appeared at the hearing are shown in Table 1.

TABLE 1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Canadian Western Natural Gas Company Limited (CWNG) N. D. McDermid	J. Hastie, P. Ag. G. P. Latonas A. G. Leinweber E. Porter, P. Eng. R. Wittmeir, P. Eng. M. G. Woolfrey, P. Eng.
Alberta Department of the Environment (Environment) and Alberta Department of Transportation (Transportation) D. B. Mason, Q.C.	H. W. Thiessen A. L. Slemko J. Schutz K. Howery, P. Eng.
City of Calgary (the City) R. F. Goss	T. K. Brown H. D. Hunter
Red Deer Lake Community Association Priddis Community Association Ms. K. Chase	Ms. K. Chase
Route A	
W. Hope-Ross (Hope-Ross Group) J. C. Drager G. A. Van Weilingen Arnold Investments Ltd. O. Babichuk Big Springs Ranch Ltd. D. Brooks G. Kluzak M. Krassman E. Sweeney F. M. Saville	W. Hope-Ross J. C. Drager G. A. Van Weilingen J. A. Arnold
W. A. Waddell	W. A. Waddell
Mr. & Mrs. Southern (Spruce Meadows) B. K. O'Ferrall H. M. Kay	B. K. O'Ferrall
R. Z. Holdings Ltd. (R. Z. Group) Hartel Holdings Co. Ltd. Ulster Developments Ltd. Myra Paperny Trafalga Investments Ltd. J. D. Rooke	

TABLE 1 THOSE WHO APPEARED AT THE HEARING (continued)

Principals and Representatives (Abbreviations Used in Report)	Witnesses
R. A. Very	
R. C. Smith, Q.C.	
Route B	
Ms. G. Allen	Ms. G. Allen
B. A. Payne	
Energy Resources Conservation Board staff	
M. Bruni, Board Solicitor	
G. C. Dunn, P. Eng.	
H. W. Knox, P. Eng.	
M. A. Francis	

Interveners who submitted written interventions but did not appear at the hearing:

Route A

C. T. Thomas
F. Brown

Route B

M. A. K. Holdings Ltd.
J. McConkey
Meridian Developments

Route C

R. A. Deans
M. A. Polding
J. Farkas
W. Farkas
F. Farkas
R. G. Barkley
Mr. R. Agnew
O. Oakes

Others

Calgary Regional Planning Commission
Municipal District of Foothills

2 THE ISSUES

The Board considers the principal issues of this application to be:

2.1 the need for a peaking gas supply for the City of Calgary (the City),

2.2 alternative sources of peaking gas supply evaluated by the applicant, and

2.3 the suitability of alternative routes proposed by the applicant.

3 NEED

The applicant intends to construct a natural gas pipeline to supply peaking gas for the City to meet the 1981-82 projected winter demand and the short term demand. CWNG stated its policy was to provide a margin of 15 per cent more supply than projected maximum demand to cope with minor upsets or severe weather with temperatures down to -37°C. In the previous five years, demand increased on the average 6½ per cent per year. During the 1980-81 winter season, the surplus over projected peak demand was 4 per cent. The applicant claimed this indicated a real possibility that south Calgary could experience a gas shortage this winter, especially if winter temperatures are severe.

Mr. Goss, representing the City of Calgary, stated that the City concurred with the projected need for the additional supply in view of ongoing development in south Calgary.

The R. Z. Group, having an interest in the N½ 21-22-1 W5M, questioned the need for a supply 15 per cent greater than projected demand. In addition, it questioned the use of -37°C in the prediction of peak demand, claiming that the Calgary area had not experienced such an extreme temperature since the late 1960's.

Other interveners did not comment on the need for peaking gas.

The Board agrees that recent winters have been mild, but accepts that it is prudent to plan on the basis of severe winter temperatures which occur periodically over the long term. Moreover, the margin proposed by CWNG does not appear excessive, and the Board agrees that there is need for additional gas supply capacity during peak demand periods in south Calgary.

4 ALTERNATIVE SOURCES OF PEAKING GAS

CWNG included in its application evaluations of alternative sources of supply of peaking gas for the City. It stated that the principal sources were the NOVA Western (Foothills) or the NOVA Eastern (Plains) systems since the NOVA systems were the only reliable source of peaking supply.

The seven schemes evaluated were pipelines originating at one of these two systems.

The pipeline schemes evaluated were:

- the Priddis Lateral,
- the Turner Valley Loop "A",
- the Turner Valley Loop "B",
- The Carbon Loop Line,
- the North East Calgary Loop, and
- the Cominco Line Extension.

Figure 2 shows the locations of these alternative sources.

CWNG indicated that the Priddis Lateral was the preferred source as it served the demand area most directly and was the most economical of the alternatives in the short term.

The R. Z. Group questioned the reliability of supply from the NOVA system and contended that the Turner Valley Loop "A", the Turner Valley Loop "B", and the Carbon Loop alternatives may be preferable when compared to the Priddis Lateral on a cost/capacity/length basis. It argued that construction of the Carbon Loop first would allow future flexibility for location of the Priddis Lateral when it was needed.

The remainder of the interveners did not question CWNG's evaluation of alternative sources of peaking gas.

The Board has reviewed the alternatives proposed as possible means to supply the peak demand for gas and concludes that the Priddis Lateral could supply the southern portion of Calgary more directly than the other alternatives. The Board also believes that the Priddis Lateral is the most cost effective of the alternatives examined.

5 TRANSPORTATION AND UTILITY CORRIDOR

The Board has decided to include the following section dealing with the Transportation and Utility Corridor (TUC) because of concerns expressed by the interveners and because the Alberta Department of the Environment (Environment) and Alberta Department of Transportation (Transportation) explained in some detail the basis for the design of the corridor and the resulting areas alloted to various future linear developments.

5.1 Applicant's Views

CWNG stated that it agreed with the transportation and utility corridor concept and that it had been directly involved in original discussions with Environment concerning the formation of a TUC.

CWNG said that the alignment of its preferred route (Route A) was in accordance with Environment's requirements within the TUC, however, it proposed two modifications to the alignments along Route A to bring the pipeline closer to Highway 22X adjacent to Section 24, 19, 21, and 22 to minimize impacts to existing residents or farm operations (dashed lines in Figure 3).

5.2 Interveners' Views

The interveners located on Route C, and the portion of Route B not in the TUC, generally accepted that devaluation of land and disruption of farming operations would be significant to landowners outside and inside the TUC on Route A. Nevertheless, they stated a preference for locating the line adjacent to Highway 22X because it was their opinion that the highway already formed a "corridor" through the area.

The City of Calgary Gas and Power Committee supported CWNG by stating that peaking gas is needed for the 1981-82 winter and that the City has utilized the TUC for its future planning. It contended that locating the pipeline in the TUC would accommodate future city growth along the highway.

Ms. Chase, representing the Red Deer Lake and Priddis Community Associations, stated that those associations would prefer no utility development in the area until such time as the legal status, in addition to the exact location of the extended TUC, is determined.

The interveners on CWNG's preferred Route A outside the TUC argued that the pipeline would extend the corridor beyond its intended boundary and create in part, a "defacto corridor" along Highway 22X thereby reducing land values. They also expressed concern regarding safety, environmental impacts to sensitive terrain, and increased noise from the highway resulting from the clearing of trees.

Interveners located within the TUC objected on the grounds of safety and impact on farm operations of CWNG's proposed routing. The legal status of the corridor was questioned; particularly Environment's requirement for CWNG to locate its line on a specific alignment within the TUC.

Environment presented a four-member panel of witnesses to explain its and Transportation's TUC requirements and position with respect to the CWNG application.

Environment detailed the background of the TUC within the Calgary Restricted Development Area (RDA). It stated that in 1976 the Lieutenant-Governor in Council established an 8 km wide RDA around the City of Calgary by Order-In-Council 212/76 pursuant to Sections 15 and 17 of The Department of the Environment Act. A purpose of the RDA was, according to Environment, to protect lands for the TUC.

Alberta Transportation set out existing and future plans for expansion and upgrading of Highway 22X. It stated that Transportation's requirements dealt only with the effect on transportation proposals and while its requirements, specifically pipeline setbacks, were sometimes different than Environment's, it believed that Environment had final jurisdiction in matters relating to the corridor. Transportation also stated it would relax its setback requirements outside the TUC from 40 m to 10 m along the south boundary of Highway 22X.

Environment explained that subsequent to 1976, committees composed of government agencies, utility companies, municipalities, the City of Calgary, and regional planning authorities recommended the 0.8 km wide TUC within the RDA. It further stated that Transportation's projected roadway needs, specifically the proposed Parkway Ring Road, provided the basic structure which controlled the overall pattern of the south Calgary TUC. A technical committee had considered land use requirements and compatability of the various utilities when designing the cross-section of the TUC. In the area of Highway 22X, and proceeding south from the highway, strips were allocated for a buffer zone, an electric-transmission zone, a service road, gas and/or oil pipelines, and distribution services followed by another buffer zone. Zone widths were determined based on projected needs over a 20-year time frame. Environment contended that corridor management flexibility could best be maintained by locating the initial installations towards the outside of each zone.

Environment pointed out that under The Calgary Restricted Development Area Regulations, approval of The Minister of the Environment is needed to construct the proposed pipeline. Although there is no legislation specifically set out to ratify creation of the TUC, matters of policy regarding the TUC were ratified by Cabinet in 1979. Environment's stated goal was ultimately to purchase the lands within the TUC.

Environment's position with regard to the portion of CWNG's route outside the western end of the TUC was that it required a setback commensurate with established corridor setbacks for approximately 2.0 km to allow for possible extension of the South Calgary Corridor when the RDA is completed around the west side of the City.

5.3 The Board's Views

The Board has previously stated its support of the corridor concept, particularly near expanding cities, where random placement of powerlines and pipelines would cause severe problems with subsequent subdivision development. It believes that, in the long term, orderly development of transportation and utility facilities is in the public interest.

The Board is sympathetic to the view that it would be preferable to have all the TUC matters resolved and firm before attempting a decision, but believes this is not feasible given the uncertainties in completion of the RDA west of Calgary and the time constraints faced by the applicant.

6 THE SUITABILITY OF ALTERNATIVE ROUTES EVALUATED BY CWNG

Prior to applying for approval of its pipeline, CWNG evaluated 5 routes in the vicinity of Highway 22X. These included two alternatives north of Highway 22X and the three applied-for routes identified as Routes A, B, and C, and shown in Figure 1.

6.1 Route A

CWNG indicated that the route parallelling the south boundary of Highway 22X, Route A, was the alignment preferred by the company. This route is located within the TUC for a distance of approximately 6.4 km. For the first 2.0 km, west of the TUC, the route is located 150 metres south of Highway 22X to satisfy the concerns of Alberta Environment with respect to the possible future extension of the TUC to the west.

During the proceedings, CWNG amended its application with respect to that portion of Route A further than 2 km west of the TUC by decreasing the setback to 10 m from 40 m wherever possible. This would apply to the remaining portion of the pipeline west of the TUC and south of Highway 22X. Transportation confirmed that a 10 m setback from the south boundary of the highway right of way outside the TUC would be acceptable.

CWNG stated that Route A was selected as its preferred route because it was the shortest route, had the best access for construction as well as future operations and maintenance and had the least impact on landowners and the environment. On that portion of the route outside of the corridor, CWNG stated that it was the company's intention to locate the pipeline as close as possible to the highway to avoid impact on landowners. This was done wherever possible, however, it was still necessary to cross Highway 22X twice and deviate from this alignment to avoid the Red Deer Lake School as well as other residences. CWNG also stated that the setback from the school met the necessary regulations.

During the hearing, CWNG re-affirmed its preference for a 17 m setback east of the Red Deer Lake School, but in light of Alberta Environment's position, maintained the 150 m alignment.

Interveners along Route A were generally concerned with the impact of the pipeline with respect to future development. Mr. Arnold, a landowner in the NW¼ of 24-22-2 W5M stated that his main concerns were land devaluation and increased environmental impact on a coulee associated with the 150 m setback compared to the 17 m setback. Alberta Environment indicated that a 17 m setback in Section 24-22-2 W5M would be unacceptable because of the possible future extension of the corridor into this area.

Mr. Hope-Ross, a landowner in the NE¼ 19-22-2 W5M, who spoke for a group of landowners in the area, voiced the opinion that the number of landowners affected by a particular routing should be a prime consideration and noted that there were fewer affected parties on Routes B and C. Mr. Hope-Ross also cited the loss of trees along the northern edge of the quarter section to be a serious consequence since the trees provided the residences with a barrier to the traffic noise along Highway 22X. He also indicated that while many of these trees were located on an unused road allowance, removal of them would result in some land devaluation. Mr. Hope-Ross made it clear that Mr. D. Brooks, although a member of the group, would probably not agree with the argument for use of Route B.

Mr. Drager, owner of a tract of land in the NW¼ 22-22-2 W5M said that CWNG's statements regarding relative ease of construction along the various routes were in error. It was his opinion, based on some years of pipeline experience, that there would be very little difference in relative construction difficulties between any of the routes.

Several landowners within the corridor where Routes A and B are common expressed their concerns to the Board. Mr. Waddell, who farms the N½ 19-22-1 W5, expressed a concern for the impact on his farming operation. Although his preference was not to have the pipeline on his property, he did indicate that it would have less impact on him if it were closer to Highway 22X (17 m) than proposed (150 m). Mr. Waddell also was concerned about the regulator station location. It was his opinion that it should be located on lands not used for farming operations.

The representative for Mr. and Mrs. R. Southern (Spruce Meadows), owners of a part of the NE¼ 20-22-1 W5M, indicated that in their view, the proposed route (Route A) was not as acceptable as Route C, however, it was not as objectionable as that previously proposed by CWNG.

The R. Z. Group (N½ 21-22-1 W5M) made representation to the Board respecting the common Routes A and B across their property. It was their contention that, should the Board approve Route A or B, the right of way should be aligned so as not to isolate any parcel of land and thereby reduce its future development possibilities. They believed Route C would be the most appropriate. It was also their opinion that, should the Board select Route A or B, there should be an easement stipulated by the Board to prevent land-parcel isolation or sterilization. Their preferred method was to approve a pipeline within a narrow easement parallelling and immediately south of Highway 22X. They suggested that any isolated block of property should be included within the pipeline easement.

Mr. Very, a landowner in the NE¼ Section 22-22-1 W5M, questioned Alberta Transportation regarding its future plans for access to parcels of property within that quarter to the west of Highway 2.

6.2 Routes B and C

The applicant indicated that Routes B and C were acceptable but pointed out that both routes and especially Route C would pose additional construction difficulties because of the rougher terrain. CWNG said that future development along Highway 22X is either well advanced or can be anticipated and planned for, whereas along Routes B and C, it is less certain, and therefore, the long term impact along Route A should be less.

Environment indicated that it would not accept Route C east of Section 17-22-1 W5M since it did not comply with the Department's corridor concept; but would accept Route B which does comply.

One intervener, Mrs. Allen, representing two acreage owners located in the NW½ 15-22-2 W5M along Route B expressed opposition to this route. She expressed the view that the value and future use and potential of their properties would be diminished if a pipeline were constructed through them. Mrs. Allen also expressed concern for trees planted on their property.

6.3 Views of the Board

The Board evaluated the three alternative routes using criteria it believes appropriate for the area in which the line would be located. Given the close proximity of the area to an expanding city, the Board believes that conformity with the corridor concept is an important criterion. A second important criterion is the current and probable future land use within the area. This is of concern to the Board since it reflects the major concerns of landowners and is an indication of the social impact of the proposed pipeline. A third major criterion is the environmental impact of the pipeline along the various routes. This is reflected in removal of trees, soil disturbance, right of way grading, and stream crossings.

Other, less critical but still significant criteria which the Board considered are technical feasibility, design, safety, and cost. Technical feasibility includes ease of construction and access to the pipeline for servicing. Conformance with the various codes determines pipe and construction design parameters which ensure efficient and safe operation. Normally, design and safety criteria apply in a similar manner to each alternative and do not have a significant effect on choice of routes. The shortest route will normally result in lowest cost unless special circumstances such as high land cost or construction difficulty leads to abnormal costs.

With respect to impact on current and future land use, the Board expects that the area south of Highway 22X will eventually become developed as an extension to the City of Calgary. On this basis, the Board believes that a pipeline route closest to the highway would have the least overall impact on future land use. Neither Routes B nor C would parallel any existing major linear developments but rather create a new linear development in the area. Furthermore, it is clear that neither Routes B nor C conform with the corridor concept, in this case a key criterion. Thus, Routes B and C have major disadvantages which could only be overcome by significant advantages in other criteria used in the route evaluation process.

Other criteria which are significant in choice of route are environmental impact, technical feasibility, safety, and cost. Routes B and C appear to present less favorable terrain with respect to environmental damage, ease of construction, and access to the pipeline for construction and for maintenance. The costs of the three routes are not significantly different.

During the proceedings, a combination of Route A and Route C was proposed. It was suggested that this combination avoided some landowner impacts and still satisfied the corridor concept. Since this route was not applied for, and referring to the comments of the Board regarding both Route B and Route C, the Board does not believe this to be viable alternative.

Route A satisfies one of the Board's key critera, that of parallelling an existing major linear disturbance and thereby adding a relatively smaller proportional impact. In addition, environmental impacts appear to be no greater than those expected on either Route B or C. The level land close to Highway 22X provides ease of construction and access. The route is the shortest but higher land-acquisition costs bring the total cost close to that of B and C. On the basis of its evaluation, the Board concludes that a route parallelling Highway 22X is the most suitable.

Some interveners on Route A expressed the view that the Board should choose either Route B or C because there was less opposition to these choices, as evidenced by the small number of interveners respecting Routes B and C. The Board accepts the concerns expressed by those landowners on Route A, but believes the number of objectors is only one measure indicating the actual impact of a pipeline on landowners and not a very precise measure at best. The degree of intrusion must also be judged by the change that the pipeline would impose on the land use in the area which it traverses. This may be assessed in a number of ways including social, monetary, and long range planning considerations. However, the Board believes the presence of Highway 22X already provides a major intrusion on those lands adjacent to it, and that the lands adjacent to the highway suffer the least relative increase in impact from added linear developments.

During the hearing, a number of other views were expressed by the interveners respecting Route A, and the Board sets out its comments on these issues in the following sections.

To the west of the Hope-Ross Group, there was only limited opposition expressed to the route. In the case of the Hope-Ross Group, the interveners expressed concern with the removal of trees along the highway which would increase exposure to highway noise. The Board believes that the impact on those landowners would not be serious since the pipeline would barely encroach on their properties; and the tree removal would be some distance from their residences, leaving a substantial stand of trees to act as a noise barrier.

The Board appreciates the concerns of Mr. Waddell, however, it is satisfied that the pipeline would not significantly affect his farming operation after initial construction and proper reclamation. The Board believes the regulator station would have an impact on his property and that it should be located on a property boundary to minimize the impact. The Board therefore concurs with the proposed location of the station on the east boundary of Section 19.

The Board has reviewed Route A with respect to the Arnold and Kluzak properties and the Red Deer Lake School. The Board notes that the pipeline routing south of the school conforms with applicable safety standards and codes and considers that the pipeline is a safe distance from the school. Further, this alignment should be maintained into the TUC to avoid potential conflicts with the future extension of the TUC and the uniform alignment should be maintained wherever possible to avoid other future problems in corridor planning.

The Board also sees merit in maintaining the 128 m alignment south of Highway 22X in Sections 21 and 22 for purposes of corridor uniformity. Possible crossings and recrossings of future pipelines would complicate construction. Non-parallel alignments between the power corridor and the pipeline corridor may increase electromagnetic coupling effects between future high voltage transmission lines and pipelines. These are consequences of changes of alignments between pipelines and powerlines within the corridor. The Board concludes that the wider setback is preferable within the TUC.

The Board sees no reason to require that CWNG acquire all the land between the proposed right of way and the highway as pipeline right of way within the TUC. In any event, Environment said at the hearing that its intention is to ultimately acquire all the land within the TUC.

In summary, the Board finds Route A, as amended, to be the most acceptable.

7 DECISION

The Board is prepared to approve Application 810487, amended, subject to the approval of the Minister of the Environment as set out in Section 8 of The Pipeline Act, 1975, and the consent of the Minister of the Environment pursuant to the Calgary Restricted Development Area Regulations.

ISSUED at Calgary, Alberta on 28 October 1981.

V E Bohme
V. E. Bohme, P.Eng.
Board Member

C. J. Goodman
C. J. Goodman, P.Eng.
Board Member

L A Bellows
L. A. Bellows, P.Eng.
Acting Board Member

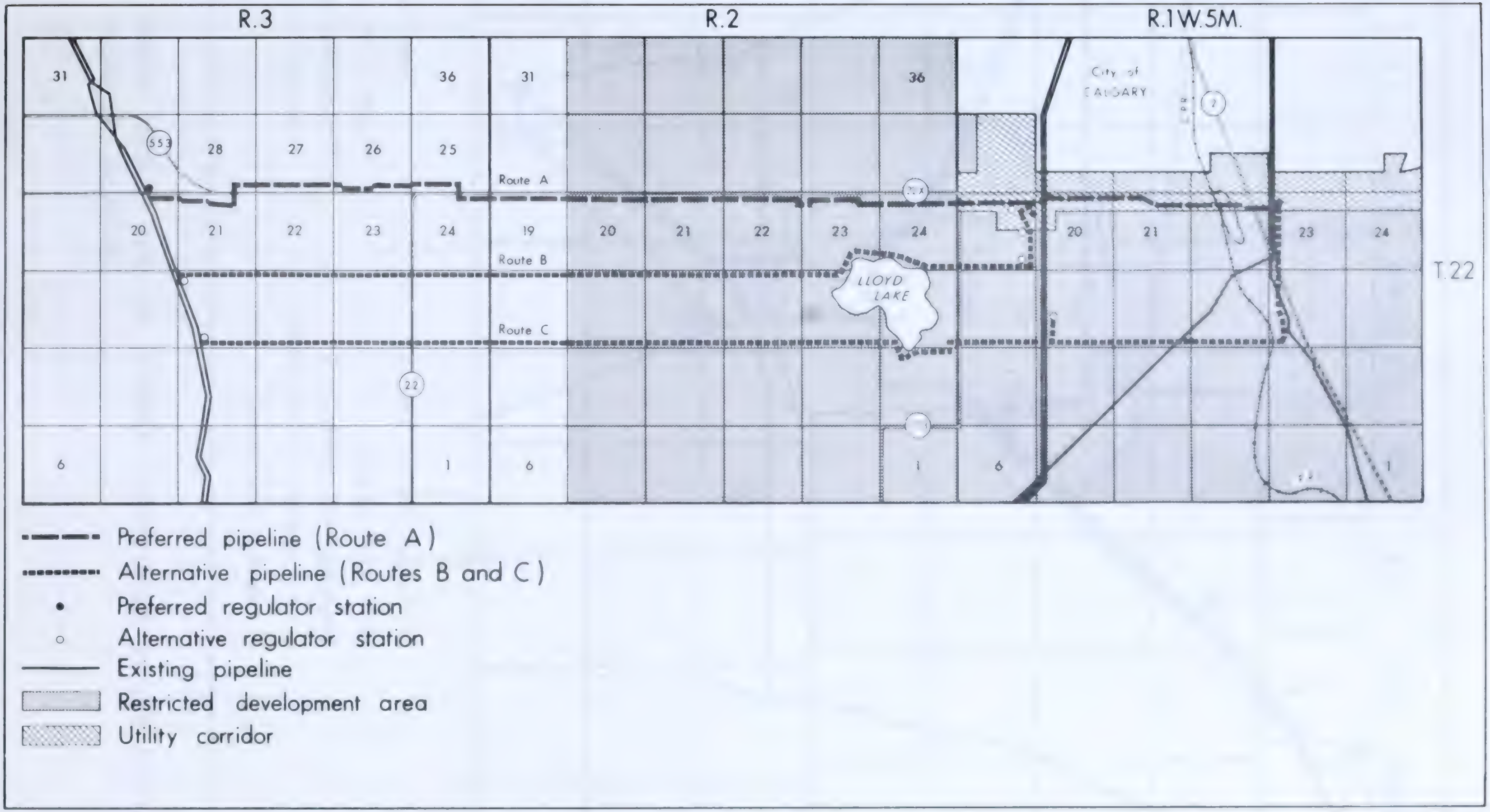

FIGURE 1 CANADIAN WESTERN NATURAL GAS CO. LTD. – PRIDDIS LATERAL. Application No. 810487

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA CANADA

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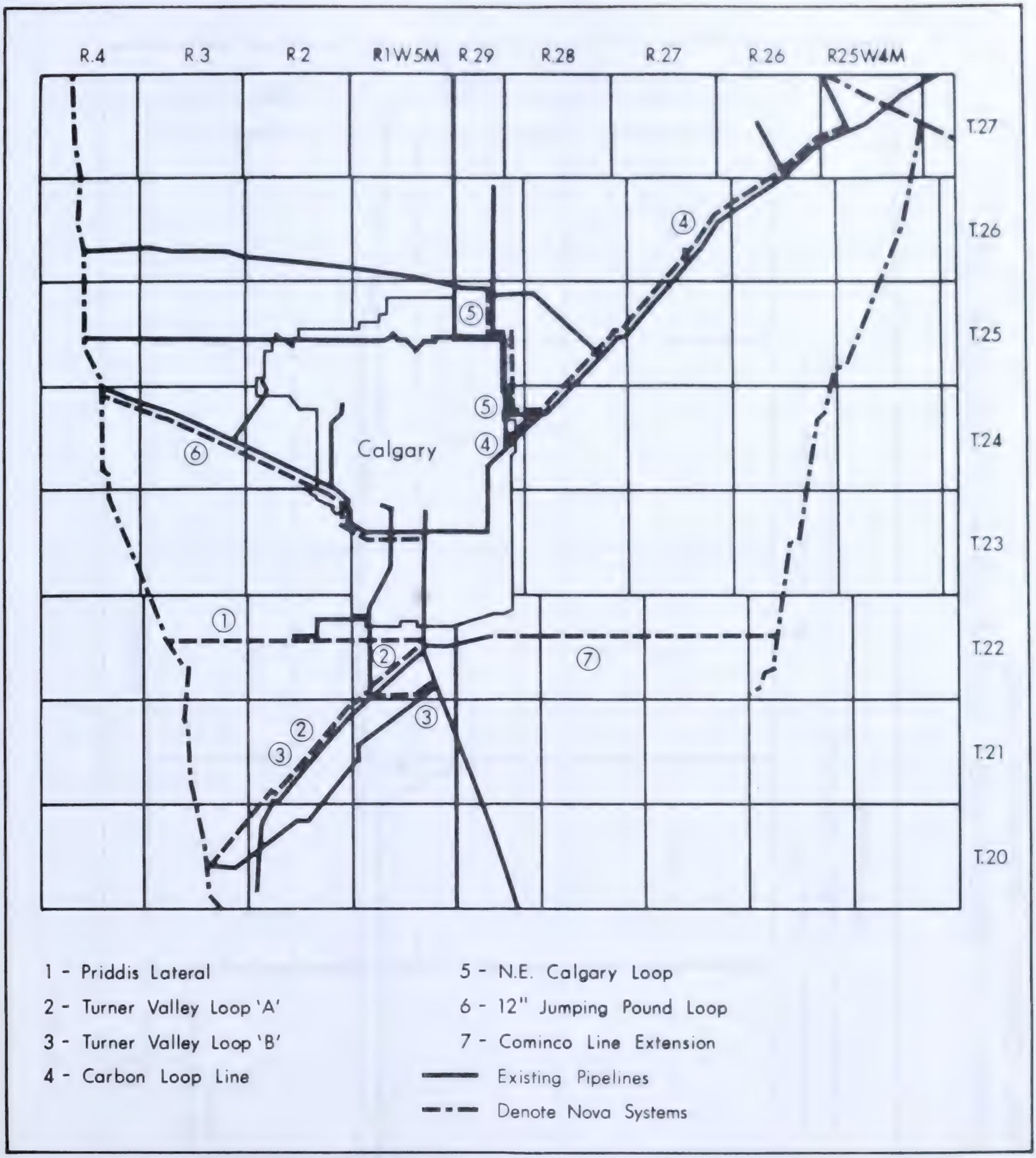

FIGURE 2 PRIDDIS LATERAL AND THE POSSIBLE ALTERNATIVES IN THE CALGARY AREA. Application No. 810487

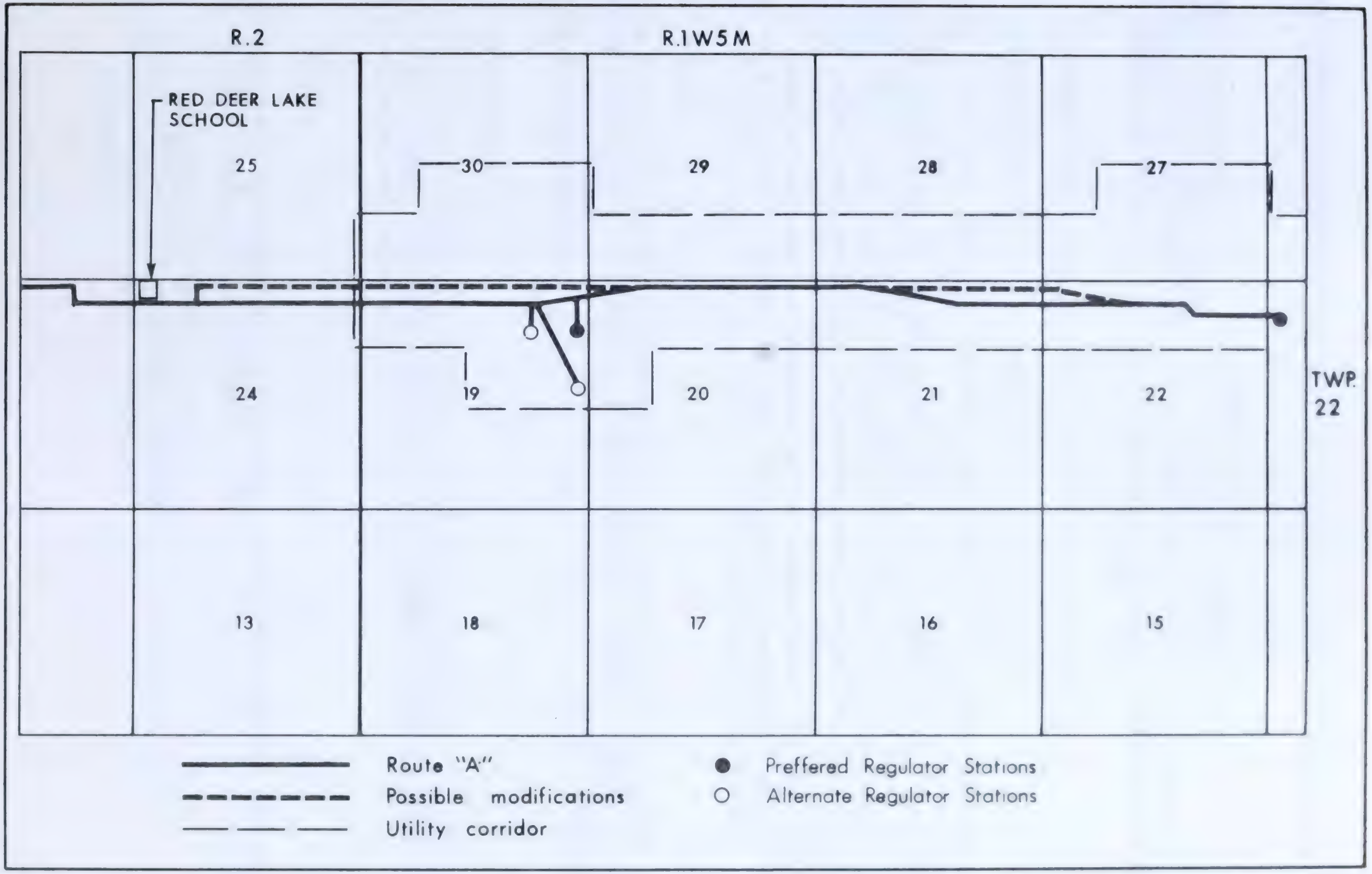

FIGURE 3 PORTION OF THE PROPOSED PRIDDIS LATERAL WITHIN THE TRANSPORTATION AND UTILITY CORRIDOR. Application No. 810487

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

UNIVERSITY OF ALBERTA
GOV'T DOCS
JAN 0 4 1982

CELANESE CANADA INC.
INDUSTRIAL DEVELOPMENT PERMIT
TO MANUFACTURE ACETIC ACID AND
VINYL ACETATE MONOMER

Decision 81-28
Application 810535

1 INTRODUCTION

1.1 Application

Celanese Canada Inc. (Celanese) applied, pursuant to section 42 of The Oil and Gas Conservation Act (the Act) for an industrial development permit authorizing the use of natural gas as feedstock and fuel, and ethylene and methanol as feedstock in the production of acetic acid and vinyl acetate monomer (VAM) in a new plant to be constructed on the applicant's existing Clover Bar site. The requested permit would authorize the maximum annual use of 500 million cubic metres of natural gas as fuel and feedstock, and 161 000 tonnes of ethylene and 213 000 tonnes of methanol as feedstock in the production of 365 000 tonnes of acetic acid and 400 000 tonnes of VAM. The applicant requested a permit term of twenty-two years commencing with plant start-up projected for July 1984.

1.2 Hearing

A public hearing of the application was held in Edmonton, Alberta, on 29 September 1981, with V. Millard, V. E. Bohme, P.Eng., and H. J. Webber, P.Eng., sitting. Participants at the hearing and the abbreviations used in this report are listed in Appendix A.

1.3 Interventions

C-I-L/Trimac, AEC/Du Pont, and AEC/Esso submitted interventions, and The City of Edmonton, Dow, Enesco, and AGEC appeared at the hearing for the purposes of cross-examination and argument only.

2 ISSUES

Having regard for its responsibilities under section 42 of the Act, the Board considers the issues of the application to be:

- availability of fuel and feedstock,
- efficient use of energy resources,
- economic impact on Alberta, and
- markets.

3 AVAILABILITY OF FUEL AND FEEDSTOCK

3.1 Availability of Gas

The applicant stated that Northwestern Utilities Limited is prepared to arrange a supply of gas for the proposed project. The electrical energy requirements would be met by on-site electrical generation, supplemented by an additional 6 megawatts purchased from local utilities to optimize the energy balance of the plant.

The Board is satisfied that supplies of gas in Alberta will be sufficient to meet Celanese's annual maximum needs (500×10^6 m^3) over the applied-for term of permit, but would nevertheless, require Celanese to satisfy the Board, prior to plant start-up, with respect to arrangements made for the required gas supply if a permit were issued.

The Board notes that the net consumption of gas as calculated by Celanese is reduced by some 158×10^6 m^3 to 174×10^6 m^3 per year by burning vent hydrogen. In considering the maximum annual requirement of 500×10^6 m^3 of gas, the Board expects that when proven economically viable, the vent hydrogen would be upgraded rather than burned.

3.2 Availability of Ethylene

Celanese is currently producing both acetic acid and VAM at the Clover Bar plant. The proposed acetic acid unit is scheduled for July 1984 start-up, upon which the existing liquid phase oxidation unit would be shut down. This shut down would reduce annual butane consumption by 117 000 cubic metres and natural gas consumption by 72 million cubic metres. The applicant proposed to use the more efficient Monsanto methanol carbonylation process which would use methanol and natural gas as feedstock. Methanol used in this process would come from the Celanese methanol unit approved earlier for the Clover Bar site.

The applicant proposed to expand its VAM unit in two steps, the first step consisting of a 200 000 tonne production expansion in mid-1984 and the second step consisting of an identical expansion to be completed in 1986. The existing 50 000 tonne unit would continue to operate after start-up of the new units, and the Celanese/Bayer vapour phase process, currently used in the existing VAM facility would be employed. Acetic acid from the proposed acetic acid expansion, ethylene, and oxygen would be the feedstocks.

The applicant's existing VAM plant is currently receiving its ethylene supply from AGEC's first ethylene plant, AGE I. Celanese is negotiating with AGEC to supply its ethylene requirements from the AGE II plant but AGEC indicated that a long-term supply from the second plant is unlikely. Celanese stated that due to problems in ascertaining ethylene suppliers and users, precise estimates of ethylene availability were difficult to make.

The applicant stated it had discussed other ethylene supply arrangements with AGEC in case the total ethylene supply for step one of the VAM expansion could not be obtained from AGE II. If Celanese were to abridge its ethylene requirements by shutting down the existing VAM unit and using that ethylene in step one of the VAM expansion, the remaining 70 per cent of its requirements could be filled from the AGE II plant if the ongoing negotiations were successful. Start-up of step two of the VAM unit would occur as soon as a further supply of ethylene is available.

Celanese submitted an ethylene supply/demand forecast for 1985, showing a sufficient supply of ethylene to meet the long-term requirements of existing projects and projects proposed in announced applications to the Board. The applicant added that the proposed ethylene-derivative plants would probably use less ethylene upon plant start-up than is stated in the applications, as production is seldom optimized at that time, nor can the markets immediately absorb the world-scale incremental blocks of product made available. If such were the case, an ethylene surplus might be available in 1985. Therefore, production from step two of the VAM unit could be initiated earlier than the proposed 1985 start-up, provided an ethylene supply was available from AGE II.

The VAM expansion would require more oxygen than is currently available from the existing plant's oxygen unit. Therefore, additional oxygen requirements would either be purchased or generated on site by expanding the existing oxygen unit.

AEC/Du Pont did not oppose the proposed project but requested that its project be viewed favourably in comparison with other ethylene derivative applications.

AEC/Esso also did not oppose the application but suggested to the Board that, in light of a possible ethylene supply deficit between the start-up of AGE II and AGE III, approval of the project be subject to obtaining a revised start-up schedule which is not earlier than the projected start-up date of the AGE III project.

On the basis of its review of ethylene availability, the Board is satisfied that in the long term sufficient supplies of ethylene would be available in Alberta to provide feedstock to all ethylene upgrading facilities that are existing, approved, and awaiting Order in Council, as well as Celanese's proposed plant. The Board has included in its supply/demand assessment, ethylene supplies which would be made available from AGE III but has made no allowances for ethylene leaving the province. By Decision Report 81-10[1] the Board indicated approval of the AGE III unit, however, the authorization of the Lieutenant Governor has not yet been received. The Board recognizes in its evaluation that ethylene requirements in Alberta will likely approach the volume of projected supplies in the 1984-85 period. Therefore, any delay in the start-up schedule of planned ethylene-producing facilities could affect the commissioning date for plants which would depend on them for ethylene feedstock. Also, the Board recognizes that there may be additional plans for the upgrading of ethylene within Alberta for which applications have not yet been filed. Such projects, if they were to receive approval, would tighten the ethylene supply/demand balance.

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[1] The Alberta Gas Ethylene Company Ltd., Industrial Development Permit To Manufacture Ethylene, ERCB Decision Report 81-10, June 1981.

As the Board believes that sufficient ethylene will be available in Alberta to satisfy demand, including Celanese's proposed use over the requested term of permit, it would be prepared, all other public interest matters being acceptable, to authorize the use of the applied-for ethylene volumes. However, as Celanese has not as yet contracted for its ethylene supply, the Board would condition any permit such that Celanese would be required to satisfy it prior to plant start-up as to arrangements for its ethylene supply. Further, as the granting of an industrial development permit does not constitute an automatic allocation of that resource, the Board takes the position that any risks associated with obtaining the required supplies of ethylene feedstock would be properly those of the permittee. The Board also notes that any contract contemplated by AGEC and Celanese for an ethylene supply from AGEC's second ethylene unit would require the approval of the Minister of Economic Development.

4 EFFICIENT USE OF ENERGY RESOURCES

Celanese proposed the Monsanto methanol carbonylation process for the manufacture of acetic acid. The existing unit which employs a liquid phase oxidation of butanes would be shut down upon successful operation of the new unit. The overall energy efficiency of the Monsanto process was estimated to be some 67 per cent.

The VAM unit would use the same Celanese/Bayer vapour phase process as is presently employed in the applicant's existing facility, although some improvements would be incorporated. The overall energy efficiency of the VAM unit was estimated to be approximately 68 per cent.

The Board is satisfied that the proposed processes incorporate efficient up-to-date technology.

5 ECONOMIC IMPACT ON ALBERTA

Celanese contended that the economic impacts associated with the proposed project would result in a net benefit to Alberta and generate significant employment opportunities.

The following table presents the economic impacts on Alberta for the period 1981 to 2004 as estimated by the applicant.

ECONOMIC IMPACT ON ALBERTA
(millions of undiscounted 1981 dollars)

Direct Impact	
Construction Costs	213
Operating Costs	523
Net Income	15
Taxes	203
Total Direct Impact	954
Indirect Impact	954
Total Impact	1 908

The construction workforce was estimated to peak at 1150 persons in mid-1983 and the estimate of operating personnel and support staff associated with the proposed addition was 148 persons.

Celanese also submitted a detailed benefit-cost analysis which included an estimate of the net benefits which would accrue to the gas production sector of Alberta over the life of the proposed scheme and two alternatives. The net benefit to Alberta from the construction and operation of the project was shown to be positive in all cases.

The Board has examined the economic impact of the proposed facility and agrees in general with the applicant. The Board believes, however, that revenues from the sale of VAM, and in the early years acetic acid (eg. 7.2 billion dollars), could be much greater than the values submitted by Celanese (eg. 5.5 billion dollars). This substantial increase in revenue estimates would take place if Alberta net-back product prices increase at a rate faster than inflation as a result of similar increases in market prices. The Board believes product prices in certain marketing areas could increase substantially in response to deregulation of gas prices in the U.S. This would then increase both taxes paid and net income.

The Board's assessment of the project cash flow and impact on the province of Alberta is similar to the estimate provided by the applicant, as tabulated below.

TOTAL COSTS AND REVENUES OF THE PROPOSED PROJECT (millions of undiscounted 1981 dollars)

Revenue From Sales	7 235
Expenditures	
Construction Costs	421
Operating Costs	608
Interest[1]	57
Municipal Taxes	73
Fuel and Feedstock	3 262
Total	4 421
Net Income Before Income Taxes	2 814
Income Taxes	
Provincial	305
Federal	804
Net Income	1 705

ECONOMIC IMPACT ON ALBERTA[2]

Direct Impact	
Construction Costs	213
Operating Costs	507
Net Income	55
Taxes	458
Interest	2
Total Direct Impact	1 235
Indirect Impact	1 235
Total Impact	2 470

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[1] Debt interest is adjusted to exclude the inflationary component of debt capital repayment.

[2] Adjusted for Alberta Content.

The values given in the economic impact analysis provide an indication of the magnitude of certain economic factors but detailed and consistent benefit-cost analyses would be required for a ranking of various projects.

6 MARKETS

Celanese stated in its application that the potential exists for production from the proposed facility to displace higher cost production from other countries. They also suggested that, about half of the production would be sold in Japan, with the remainder being marketed in Europe, the U.S., and Latin America.

The viability of the proposed project is assured, Celanese contended, if gas in Alberta continues to be priced lower than in other centres of petrochemical production.

The Board believes that although the global VAM productive capacity appears to exceed demand at present, this may change as demand increases over the next decade. The Board accepts the possibility that, in both the Pacific Rim and certain areas of the United States, production from the Celanese Clover Bar complex could displace product from other sources of supply primarily as a result of the lower fuel and feedstock costs in Alberta.

In light of the combination of an ability to penetrate existing markets and a potentially healthy market growth rate, the Board believes sufficient demand will exist to accommodate the estimated production throughout the life of the proposed facility.

7 PERMIT TERM

Celanese requested that a permit for the use of energy resources in the production of acetic acid and VAM be issued for a term of 22 years commencing with plant start-up projected for July 1984.

The Board believes that in light of the two year interval between step one and two of the VAM expansion unit, the permit term requested by Celanese is appropriate.

8 DECISION

Having regard for its findings and responsibilities under the Act, the Board is prepared, with the approval of the Lieutenant Governor in Council, to grant the applied-for industrial development permit to Celanese Canada Inc. The permit would be in the form shown in Appendix B, and subject to all of the terms and conditions therein and to any terms and conditions imposed by the Lieutenant Governor in Council.

ISSUED at Calgary, Alberta, on 26 November 1981.

ENERGY RESOURCES CONSERVATION BOARD

Millard

V. Millard
Chairman

Bohme

V. E. Bohme, P.Eng.
Board Member

H. J. Webber

H. J. Webber, P.Eng.
Acting Board Member

APPENDIX A

TABLE OF HEARING PARTICIPANTS

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Celanese Canada Inc. (Celanese) D. G. Hart	Dr. A. Lamb, P.Eng. J. Kuziak, P.Eng. J. Lambie, P.Eng. N. Martin C. Watkins Dr. R. Mansell
The City of Edmonton M. McAvoy	
Dow Chemical of Canada, Inc. (Dow) C. E. Repchinsky	
C-I-L Inc. and Trimac Ltd. (C-I-L/Trimac) T. H. Ferguson	
Alberta Energy Company Ltd. and Du Pont Canada Inc. (AEC/Du Pont) D. Wood	
Alberta Energy Company Ltd. and Esso Chemical Canada (AEC/Esso) R. C. Pittman	
Enesco Chem Ltd. (Enesco) F. R. Foran	
The Alberta Gas Ethylene Company Ltd. (AGEC) F. R. Foran	
Alberta Environment F. Witthoeft	
Energy Resources Conservation Board staff M. J. Bruni, Board Solicitor M. D. McDonald W. J. Schnitzler, P.Eng. C. A. Burridge	

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit to Celanese Canada Inc. authorizing the use within Alberta of ethylene, methanol and gas produced in Alberta for the production of acetic acid and vinyl acetate monomer

INDUSTRIAL DEVELOPMENT PERMIT NO. CCL 81-1

WHEREAS Celanese Canada Inc. has applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42, subsection (2) of The Oil and Gas Conservation Act, authorizing the use of ethylene, methanol and gas produced in Alberta for the production of acetic acid and vinyl acetate monomer in Alberta; and

WHEREAS the Board is of the opinion that the granting of this industrial development permit for the use of ethylene and methanol as raw material and gas as fuel in the production of acetic acid and vinyl acetate monomer is in the public interest, having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council, by Order in Council, numbered O.C. and dated , 19 , has authorized the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to Celanese Canada Inc. (hereinafter called "the Permittee") authorizing the use of ethylene and methanol as raw material and natural gas as fuel and feedstock in the production of acetic acid and vinyl acetate monomer, subject to the regulations and orders made pursuant to the said Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use by the Permittee of ethylene and methanol as raw material and gas as fuel and feedstock in the production of approximately 365 000 tonnes of acetic acid and 400 000 tonnes of vinyl acetate monomer per year as described in the application from the Permittee, dated July 2, 1981.

2. The ethylene and methanol as raw material and gas as fuel authorized by clause 1 is for use in an acetic acid and vinyl acetate monomer plant to be constructed on the Permittee's existing site located in Section 17, Township 53, Range 23, West of the 4th Meridian.

3. Subject to the conformity by the Permittee with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on December 31, 2006.

4. The quantity of energy resources that may be used in the facilities referred to herein in the production of acetic

acid and vinyl acetate monomer shall not exceed 161 000 tonnes of ethylene and 213 000 tonnes of methanol per calendar year as raw material nor 500 000 000 cubic metres of gas per calendar year as fuel and feedstock.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37 400 000 joules per cubic metre.

6. All ethylene, methanol and gas used in producing acetic acid and vinyl acetate monomer pursuant to this permit shall be measured by or on behalf of the Permittee in a manner satisfactory to the Board, and the volumes of ethylene and methanol used as raw material, gas used as fuel and acetic acid and vinyl acetate monomer produced shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittee shall obtain the approval of the Board of any major changes in design of the plant facilities.

8. (1) The Permittee shall satisfy the Board prior to , as to the arrangements that have been made for the supply of energy resources for the operation of its acetic acid and vinyl acetate monomer plant, unless upon application by the Permittee a later date is stipulated by the Board.

(2) The Permittee shall satisfy the Board prior to , that construction of its proposed project has commenced or will commence on or before , and that construction of the proposed facilities will continue in

accordance with a schedule approved by the Board, unless upon application by the Permittee, later dates are stipulated by the Board.

(3) During the construction of the proposed project, the Permittee shall inform the Board, on a semi-annual basis, of the progress of construction.

9. The Permittee shall operate the facilities in a manner that results in

(a) the maximum practicably obtainable efficiency in the use of ethylene, methanol and gas for the manufacture of acetic acid and vinyl acetate monomer, and

(b) the maximum practical conservation of ethylene, methanol and gas.

10. The Permittee shall not

(a) assign this permit, or

(b) release from its control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

11. (1) Attached hereto as Appendix A and made part of this permit, is the Order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the Order of the Lieutenant Governor in Council set out in Appendix A.

12. Where it appears to the Board or the Lieutenant Governor in Council that the Permittee has contravened or failed to comply with any term or conditions contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and, with the approval of the Lieutenant Governor in Council, may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

(b) the Lieutenant Governor in Council may amend, vary, add to or replace any terms or conditions contained in this permit.

13. Notwithstanding the provisions hereof, the Permittee shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of energy resources within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

V. Millard
Chairman

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

NORTHEAST EDMONTON PIPELINE CORRIDOR INQUIRY

INQUIRY REPORT 81-29
PROCEEDING 810385

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1 INTRODUCTION

Over the recent months, the Energy Resources Conservation Board (Board) has received and considered several applications for pipelines terminating or originating in the northeast part of Edmonton. One such proposal was by Alberta Energy Company Ltd. (AEC), for crude bitumen blend and diluent pipelines between Cold Lake and Edmonton, and another, submitted by Shell Canada Limited (Shell), was for a variety of refined and semi-refined products pipelines between the new Scotford refinery in the Fort Saskatchewan area and the Interprovincial Pipe Line terminal at Edmonton.

In its consideration of the various proposals, the Board approved certain portions of these applications and deferred others, pending a review of the practicality of creating a pipeline corridor in the northeast part of the Edmonton area. The deferred portions have been more specifically described in the Board's previous Decision Reports 81-7[1] and 81-19[2], but generally all the routes to the southwest of Aikenside (Point K on Figure 1) were deferred pending a study of the area.

Having regard for the extent of urban and industrial development currently taking place or planned in the future for the northeast Edmonton-Fort Saskatchewan area, and taking into account the large number of additional pipelines that will probably be required to serve or pass through the area, Alberta Environment commissioned the firm of Stewart, Weir, Stewart, Watson, Heinrichs & Dixon (Stewart-Weir) to do a pipeline corridor location study for ingress and egress to northeast Edmonton. The terms of reference of the study were (a) to provide information regarding the necessity of such a pipeline corridor, (b) to outline various corridor alternatives, and (c) to recommend a preferred route. Other matters that were addressed concerned the administration and operation of such a corridor, and the width necessary to accommodate all future pipelines.

Following completion of the Stewart-Weir Report, the Minister of the Environment believed it would be of assistance to the Government for the Board to hold an inquiry and gain public input into the best location for a pipeline corridor, and the optimum width that would be appropriate for future pipeline requirements. Accordingly, the Minister sought approval of the Lieutenant Governor in Council to request the Board to hold such an inquiry, and the result was Order in Council No. 545/81, dated 17 June 1981. (See Appendix II)

The mandate given to the Board in the Order in Council was to make inquiries into and report on

(a) the most desirable route for a pipeline corridor from the Sherwood Park West and Edmonton Restricted Development Areas north of the Canadian National Railway marshalling yards to a point near Highway 21, and

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[1] Energy Resources Conservation Board, 1981. Applications for Permits to Construct Pipelines and Related Facilities Between Lloydminster and Cold Lake, and Between Edmonton and Cold Lake. ERCB Decision Report 81-7, Calgary, Alberta.

[2] Energy Resources Conservation Board, 1981. Application for Permits to Construct Pipelines and Related Facilities in the Edmonton-Skaro Area. ERCB Decision Report 81-19, Calgary, Alberta.

(b) the width of a corridor that would be appropriate, having regard for future pipeline requirements in the area.

Figures 1, 2, 3, and 4 show the area under consideration and the major route alternatives suggested at the inquiry.

2 THE INQUIRY

A public inquiry to consider the Stewart-Weir Report and all submissions filed with the Board was held in Edmonton on 15 and 16 September 1981, with G. J. DeSorcy, P.Eng., V. E. Bohme, P.Eng., and N. Strom, P.Eng., sitting. Those who appeared at the hearing are identified in Appendix I.

3 PRELIMINARY MATTERS

3.1 Clarification of Terms of Reference (O.C. and Notice)

At the outset of inquiry proceedings, the Board clarified an apparent misunderstanding arising from the terms of reference of Order in Council No. 545/81 and the Notice of Inquiry. In accordance with the Order in Council, the Board was requested to inquire into and report on proposed pipeline corridor routes north of the Canadian National Railway marshalling yards, whereas the Notice invited submissions from landowners or other interested persons concerning alternative routes north or south, if appropriate, of the same marshalling yards. The Board explained that this reference was included in the Notice to alert all landowners, occupants, or potentially affected persons south of the marshalling yards to ensure that they were given adequate notice, bearing in mind that the Stewart-Weir Report included certain routes south of the yards. In view of the terms of reference of the Order in Council, the Board said it would not recommend to the Cabinet any routes other than those north of the marshalling yards.

3.2 Request for the Stewart-Weir Report Reference Data

At the start of the inquiry, Mr. Schwab, counsel for Johannes Prinz von Thurn und Taxis, made reference to documents cited in the Stewart-Weir Report which he was unable to obtain. Mr. Schwab claimed his client's case was being prejudiced by not having the relevant documents available for study, since he believed that the merits of routes other than through his client's property had been based in part on this reference data. He requested the assistance of the Board in having the missing reference material produced for the inquiry.

Counsel for Mr. Weir, author of the Stewart-Weir Report, argued that some of the requested information was confidential. He stated that Mr. Weir was willing to answer questions on the information on which he based his report, but reiterated that Mr. Weir did not have the authority to provide some of the documents in question. Mr. Weir's counsel further advised the Board that part of the information requested was available and could be produced if necessary.

The Board, after considering the matter, ruled that certain of the reports requested by Mr. Schwab should be made available, including those for which special permission of the involved parties would have to be obtained by Mr. Weir. In the case of one document, the Executive Summary from the March 1981 Edmonton-Skaro Corridor Study, the Board decided that it did not require that document to be placed before it in order to discharge its responsibilities regarding the corridor inquiry and accordingly ruled against that part of Mr. Schwab's request.

4 SUBMISSIONS NOT DEALING WITH CORRIDOR ROUTE OR CORRIDOR WIDTH

4.1 Canadian Petroleum Association

In its submission, the CPA stated that it was aware of industrial and residential development plans outside the Sherwood Park West and Edmonton Restricted Development Areas north of the Canadian National Railway marshalling yards to a point near Highway 21 (Aikenside), and that it was concerned that such development could block pipeline access from northeast of Edmonton to the Strathcona refinery area. Accordingly, it supported the establishment of a pipeline corridor to assure proper access to the aforementioned areas. The CPA claimed that such a corridor would not only have significant advantages for presently-planned and future pipelines, but would optimize land utilization and development.

4.2 The Alberta Gas Ethylene Company Ltd.

AGEC did not oppose the corridor proposal in principle but outlined a number of concerns it had concerning its existing ownership and operation of two existing ethylene pipelines which passed through the study area. Specifically, the company opposed any proposal that would require it to move its lines; wished to reserve all rights to install another pipeline in its existing right of way; and requested that should a corridor be established, the allocation of individual pipeline space proceed without delays. In addition, AGEC expressed concerns about the multiple, large diameter, common-tunnel crossings referred to in the Stewart-Weir Report, and cited a number of possible engineering difficulties that might be encountered in the design of the tunnel itself and the operation of pipelines within it.

4.3 The County of Strathcona No. 20

The County supported the Stewart-Weir Report recommendations mainly because of a nine and one-half million dollar loss that would accrue from expenditures for sewer, water, roadway, and sewage treatment facilities already installed in developable lands south of Highway 16 if a corridor were located across such lands. The County favoured an early resolution to the corridor problem in order to expedite plans already in hand, and allow the principals to proceed from known facts.

4.4 Imperial Oil Limited and Esso Resources Canada Ltd.

Among other matters (cited elsewhere in this report), Imperial and Esso stated that while they supported the corridor concept, expediency of establishing such a corridor must be the prime consideration. They recommended that such a corridor be declared a Restricted Development Area from the outset in order to expedite matters.

5 THE APPROPRIATE ROUTE

The Board compared all of the alternative routes suggested at the inquiry on the basis of landowners' concerns, relative impact on existing and future development, environmental impact, and technical and economic considerations.

5.1 Stewart-Weir Routes

The routes studied in the Stewart-Weir Report are shown on Figure 1. Mr. Weir indicated that Route 1 had been selected as being the most preferable after considering ten comparative criteria. These were:

- Minimum adverse social and environmental impact
- Maximum use of existing RDA's
- Minimum conflict with existing and proposed land subdivision
- Minimum conflict with Regional and other statutory plans
- Suitable distance from existing and planned residential areas
- Maximum safety in corridor operations
- Minimum overall investment cost
- Maximum potential for land reclamation
- Maximum compatibility with secondary land usage
- Avoidance of areas of land that are likely to be rezoned for a more intensive use.

The Stewart-Weir Report indicated that Route 1 maximizes the use of existing RDA's; that is, nearly one-third of the acreage required would be within the existing Edmonton and Fort Saskatchewan Restricted Development

Areas. It also indicated that Route 1 would least affect land already committed to higher density development, and that very little of the land on Route 1 would change from agricultural to a more intensive land use over a long-term planning period. It was also submitted that since more of the Route 1 corridor would be a considerable distance from future urban development, this represented less outside disturbance and therefore a safer pipeline environment.

Although the Stewart-Weir Report did address the minimizing of overall investment costs, Mr. Weir stated that economic considerations were not given a high priority in the selection process. During direct evidence and cross examination, Mr. Weir referred to proper land use in connection with existing and planned infrastructure. In his view, Routes 2 and 4 (see Figure 1) presented significantly greater obstacles in this regard since existing Area Structure Plans within sections 22 and 15 were either under consideration or already approved. He also stated that even though Routes 3 and 5 originated south of the CNR marshalling yards and were thus beyond the terms of reference for the inquiry, it was his view that these routes would have much greater impact on existing and planned residential and commercial developments. Similarly, it was Mr. Weir's contention that because of existing RDA's and other constraints, secondary land uses would be less impacted on Route 1.

Other participants at the inquiry were of substantially the same opinion as Mr. Weir with regard to the factors mentioned. Industries having interests in land on Routes 2 and 4 gave evidence as to how a corridor on those routes might affect their interests. No significant discussion took place respecting Routes 3 and 5.

Turbo indicated that it had committed some $3.5 million to developments already under construction in the west half of sections 14 and 23. Turbo representatives also said that some effort had been made to co-ordinate the Area Structure Plan with those land holdings to the west with respect to road access for the overall industrial area. In Turbo's opinion, a pipeline corridor along Routes 2 or 4 would remove a significant amount of prime industrial land from its development and would fragment the development.

Canada Cement, with interests in the northeast quarter of section 16, indicated that it had a development permit to construct a concrete-block facility in this parcel. It said that a 600-foot corridor would eliminate the presently-planned site, and further indicated that the selection of Routes 2 or 4 would interfere with a proposed gravel removal operation within the same land, thereby causing substantial economic loss to the company.

The City of Edmonton's position with respect to the Stewart-Weir routes was one of general agreement with Route 1, since the City's interest was mainly concerned with lands within the City.

The Edmonton Regional Planning Commission neither opposed nor supported the specific routes recommended by Mr. Weir. The witness did indicate, however, that subject to the Board's review, the ERPC did not oppose the Stewart-Weir Route 1.

5.2 Shell, AEC, and NUL Routes

A joint technical submission, on behalf of the three companies was prepared and supported by Associated Kellogg Ltd. and Canuck Engineering Ltd. The routes recommended for consideration are shown on Figure 2.

This group generally agreed with the Stewart-Weir Route 1, and indeed its recommended route was very similar to Mr. Weir's Route 1. The group indicated in response to questions that it did not anticipate serious technical problems associated with the Stewart-Weir Route 1, particularly with respect to the necessary tunnel crossings.

5.3 ERPC and City of Edmonton Routes

The ERPC routes are shown on Figure 3, and those proposed by the City of Edmonton are on Figure 4. The ERPC alternative routes and one of the City's proposed routes essentially extend easterly from section 22 to the railway tracks in section 23. Both parties generally favoured the parallelling of the railway tracks from the most southerly possible location.

The City of Edmonton acknowledged that it had minimum concern for lands outside the city boundaries and stated that it had little difficulty accepting the Stewart-Weir Route 1. Its submission was influenced by ERPC guidelines with regard to parallelling railways and power lines.

The ERPC, while presenting alternative routes for the Board's consideration, indicated during questioning that these had been put forward as topics of discussion which illustrated routes that conformed with ERPC's corridor policies. The witness for the ERPC also indicated personal support for the Stewart-Weir Route 1 on the basis of evidence presented at the inquiry, but was unable to offically accept it for the ERPC since the latter had prepared its submission without benefit of the discussion at the inquiry.

None of the other participants had any comments respecting the routes proposed by the City of Edmonton and the ERPC.

5.4 Routes Proposed by the Van Heckes

The Van Heckes' submission indicated that they would prefer a route extending directly east from either the Interprovincial Pipe Line terminal or the Clover Bar area to east of Highway 21, and from there north, intersecting with the Canadian Pacific Railway tracks northeast of Aikenside. Their proposed route and an alternative are shown on Figure 2. No other participating parties expressed an opinion regarding the Van Heckes' proposed routes, and Mr. Van Hecke did not speak to his submission.

5.5 Board Views Regarding General Location of a Corridor

As indicated earlier in this report, routes south of the Canadian National Railway marshalling yards were not deemed to be within the terms of reference of the inquiry. Accordingly, the Board has dismissed those possibilities which include the Stewart-Weir Routes 3 and 5, and the routes suggested by the Van Heckes.

The presentation of a joint technical submission by AEC, Shell and NUL indicated to the Board that, although the Board currently has applications by two of these companies for several route combinations within the area, the companies are prepared to accept a single common alignment as selected by the Board, and then subsequently amend their respective applications to conform to that alignment. The Board further notes that these companies proposed a route very similar to the Stewart-Weir Route 1. For purposes of comparison in selecting the general location of a corridor, the Board is therefore considering the preferred routes of Stewart-Weir and AEC-Shell-NUL to be the same.

In comparing the alternatives, and based upon the evidence presented, the main factor considered by the Board was that of primary and secondary land use, both now and in the future. The evidence did not suggest any clear economic choice and therefore the Board did not give significant weight to this factor. The Board did, however, consider the relative merits of pipeline safety and security for the various corridor alternatives.

From the information presented, the Board concludes that the Stewart-Weir Routes 2 and 4 through sections 14, 15, and 16 would, in the near future, interrupt in some way a significant amount of either existing or planned urban development, most of which would be industrial in nature. Although in general, the Board believes that pipeline corridors should be compatible with industrial development, it is of the opinion in this case that the corridor could cause a significant number of modifications to area plans which have progressed to the point of construction. This would result in significant economic impact to at least one industry already established in the area.

With respect to the various routes presented by the City of Edmonton and the ERPC, the Board notes that the portions within sections 22 and 23 conflict with the approved Area Structure Plan and developments already in progress. Other suggested variations within section 22 do not appear to have addressed landowner concerns, and additionally, do not have any clear advantage when compared to the Stewart-Weir Route 1.

With regard to the ERPC proposed route proceeding northeasterly from section 22 to the north boundary of section 26, the Board heard little technical evidence respecting this route but sees only nominal difference in corridor length or land impacts when compared to the Stewart-Weir Route 1.

Certain routes suggested by the City of Edmonton and the ERPC took advantage of existing linear disturbances such as electric power transmission lines and railways. With respect to power lines, the Board normally sees some advantage in the selection of a pipeline location parallelling other utilities and resulting in a multiple-use corridor. However, in this instance a pipeline corridor is being selected to accomodate an expected large number of lines in an area of considerable congestion. For this reason the Board does not believe a multi-purpose corridor, which could require a strip of land up to one-half mile in width, should be considered. Additionally, the Board does not believe a corridor for a large number of expected pipelines should be dictated by the location of one relatively minor existing power line.

Regarding the railway, the Board agrees with some participants that a route parallelling the railway would cause difficulties in laying pipe to follow curves in the railway right of way, and create conflicts between pipelines and existing and planned land use. This problem would be made more serious by the existence of a number of pipelines near the railway, which would preclude the closer spacing of future lines to minimize the required width of right of way. The Board also notes evidence suggesting that a corridor along the railway would reduce convenient access to the railway and thus impact on the future utilization of nearby lands.

The Board has reviewed evidence regarding pipeline safety and security, and believes that the Stewart-Weir Route 1 offers a safer corridor location than do other alternatives because population density would be lower near it.

In summary, the Board concludes that the Stewart-Weir Route 1 is the most suitable general corridor location, and notes that most participants in the inquiry were of this view. In arriving at this conclusion, the Board had regard for potential problems with the tunnels under the railway marshalling yards, but on the basis of evidence presented by Mr. Weir and witnesses for AEC-Shell-NUL, the Board believes such problems would not be serious enough to cause it to select another general route for the corridor.

5.6 Suggested Route Modifications to the Stewart-Weir Recommended Route (Route 1)

Some of the participants, while generally accepting the recommended route in the Stewart-Weir Report, suggested certain modifications because of the adverse affect the route would have on their lands or on pipeline construction and operations. These modifications are shown on Figure 5.

The route proposed by AEC-Shell-NUL differed from the Stewart-Weir Route 1 in section 21, near Point T on Figure 5. The reasons for the suggested route change were to lessen the severity of the bend needed in the pipelines and reduce the possibility of sloughing problems during construction by having the pipelines come out of the ravine and onto the escarpment. Essentially all participants, including Mr. Weir, agreed with this suggested change.

AEC-Shell-NUL also proposed a modification along the north side of section 22 (Points R and P on Figure 5) intended primarily to accomodate landowner wishes. The changes would result in the corridor being on the south side of the section line for the west half of section 22, then crossing over to north of the section line for the east half.

AEC-Shell-NUL further suggested that the corridor should proceed north along the west boundary of section 26 rather than the middle of the section as proposed by Stewart-Weir. This would take advantage of what AEC-Shell-NUL perceived to be a superior ravine crossing at Point M (Figure 5) rather than Points N or O, and provide a more suitable route from the viewpoint of landowners. After crossing the ravine, the corridor could continue north to the top boundary of section 26 and then turn east at Point X, or alternatively it could go one-half mile east to the middle of section 26, then north to Point L. AEC-Shell-NUL suggested that if the line ran north for any distance along the middle of section 26, it should be completely east of the half section line rather than straddling it. In their opinion, this would better accomodate landowner wishes.

Mr. Schwab, counsel for Johannes Prinz von Thurn und Taxis, stated that many of his client's concerns would be eased if the route change identified as R-P-M in the AEC-Shell-NUL report and shown on Figure 5 was adopted. It would prevent isolation of a pocket of land identified as Parcel A in the northwest quarter of section 22, and would allow road access to the north from the approved Area Structure Plan for section 22.

Turbo Resources favoured a modification to the Stewart-Weir recommended route that would place the proposed corridor on the north side of the east-west road between the road and the Oldman Creek ravine. Locating the corridor on the north side of the road would permit good access to its industrial subdivision south of the road, and would alleviate a storm-water drainage problem from Turbo's lands that would develop should the corridor be located south of the road. Although Turbo favoured a route from Point P to Point O along the north side of the road, it admitted under questioning that its first choice for a crossing of the Oldman Creek ravine would be at Point M.

Mr. Liebel, counsel for Turbo, stated that conversations with landowners in section 26 led him to the conclusion that they would prefer a ravine crossing at Point O as suggested by Stewart-Weir, rather than Point M as suggested by AEC-Shell-NUL. However, he noted that the landowners in question did not make a presentation to the inquiry.

Mr. Jackson, who owns part of the east half of section 26, supported the route modifications cited by Turbo Resources, but in addition favoured a further modification north from Point O to Point L (Figure 5) that would place the corridor wholly to the east side of the quarter section line in section 26.

5.7 Board Views Regarding Suggested Modifications to Stewart-Weir Route 1

Regarding the proposed modifications to the Stewart-Weir Route 1, the Board has assessed the evidence presented and concludes that the following modifications minimize land impacts and provide the most technically suitable route:

1 A corridor curve modification in the southwest quarter of section 21 (Point T on Figure 5). The Board concurs with this modification as recommended by AEC-Shell-NUL in their technical report.

2 Relocation of the corridor at the northwest boundary of section 22 (Point R on Figure 5). The Board notes that this modification would accommodate a landowner and eliminate two side-bends within the pipeline corridor. The Board concurs with this suggested modification.

3 Section 22 exit location (Point P on Figure 5). From the evidence presented, the Board agrees that the alignment diagonally crossing the north boundary of section 22 would reduce the impact on the potential industrial development area within section 22. The Board also considers this modification desirable because of additional security which may be afforded the corridor by being moved away from potential road access to the industrial area. The Board therefore adopts this suggested modification.

4 Southwest quarter of section 26 (Point M on Figure 5). The Board has reviewed the technical evidence presented, as well as the stated landowner concerns respecting this area and concurs with the AEC-Shell-NUL ravine crossing location (Point M). The Board, having reviewed the ravine crossing at Point O, believes that a substantially greater amount of engineering and geotechnical work would be necessary for this route in order to provide a corridor with equal pipeline safety. A crossing at Point O would require initial installation of a culvert across the entire corridor width, whereas the crossing at Point M could accomodate each line as required. Additionally, if the corridor were to cross the ravine at Point O, it is the Board's view that the route should be from Point P to Point O along the south of section 26 as shown on Figure 5. The space available for the corridor between the ravine and north of the section line would be insufficient, requiring some fill to be placed in the ravine. This would be expensive and unstable for a multi-pipeline corridor. Selection of the "M" route would also leave the potential building sites along the south boundary of section 26 open. Although the "M" route may take other potential building sites along the west boundary of section 26, there appears to be an equal trade-off in this regard.

The Board notes the comments of Mr. Jackson in regard to the location of the corridor relative to the north-south quarter section line in section 26. The Board agrees that the corridor should exit the southwest quarter of section 26 by following east along the quarter line to the centre of the section. It should then cross the quarter line and turn north on the east side of the north-south quarter section line. This would minimize the impact on the northwest quarter of section 26, and would not segregate land parcels within the east half of the section.

6 CORRIDOR WIDTH

6.1 Views of Stewart-Weir

Mr. Weir estimated that within the next fifteen years, approximately twenty-four pipelines could be located in the corridor. At a conservative spacing of 15 feet between oil lines and 30 feet between gas lines, a corridor width of 600 feet was deemed to be adequate. He stated that this still provided considerable spacing flexibility inasmuch as some of the pipelines could be laid in common ditches, others would serve dual purposes, and product batching could reduce the total number of lines ultimately needed. Mr. Weir also pointed out that if reduced spacing between pipelines was deemed to be sound, the total number of lines that could ultimately be accommodated could go as high as fifty. In response to questioning about the impact of a 600-foot wide corridor on his route selection, Mr. Weir stated that nowhere along his preferred route did the width affect the route selection. In fact, he concluded that for most if not all the length along his recommended route, the width could be increased if necessary by up to 200 feet. His choice of optimum width, however, remained at 600 feet.

6.2 Views of Others

In addition to the recommendations stated in the Stewart-Weir Report for corridor width, a number of other submissions contained comments and recommendations on the same matter.

The submission prepared by the consulting group representing Shell, AEC, and NUL, made no attempt to predict the ultimate number of pipelines that might occupy the corridor, and therefore did not recommend a corridor width. The report did, however, include a comprehensive analysis of spacing criteria for pipelines located in a corridor configuration. Based upon a number of engineering considerations such as crater dimensions, impact damage assessments on adjacent parallel lines resulting from controlled burst tests, and thermal effects on buried lines from escaped flammable products, the report recommended spacings of 1.0 to 1.5 metres between liquid lines and 4 to 5 metres between gas lines. Using the same numbers of pipelines as the Stewart-Weir Report (12 liquid lines and 12 gas lines) and the above spacing recommendations, the corridor width would be approximately 254 feet. If the number of anticipated lines were doubled, the ultimate width of corridor needed would be 508 feet.

Imperial and Esso in their submission stated that company practice is to leave no less than five metres between oil or gas pipelines when constructing new lines beside existing lines, and recommended that this criteria apply to the corridor. Based upon these spacing suggestions, twenty-four pipelines would require a corridor width of approximately 360 feet. Twice the number of pipelines would require an ultimate corridor width of 720 feet.

Dome Petroleum supported the Stewart-Weir Report corridor width of 600 feet as a minimum, but added the proviso that the usage of such a corridor be limited to pipelines only.

Daon also appeared to be in favor of the corridor width recommended in the Stewart-Weir Report, but generalized that the width should be adequate to accommodate not only all pipelines in the foreseeable future, but also all necessary major electrical transmission lines and other facilities. This was in direct contrast to the Dome submission which asked that the corridor be reserved exclusively for pipeline use.

Some submittors were unalterably opposed to a corridor route through their property, and pointed out the negative affects that a 600-foot wide corridor would have. Other submissions either indirectly supported the Stewart-Weir corridor width or were silent on the subject.

6.3 Views of the Board

Taking into account the various recommended spacing distances, construction techniques, and operating procedures suggested by different submittors, and recognizing the difficulty of forecasting the ultimate number of pipelines that might occupy the corridor, the Board believes that the 600-foot wide corridor recommended in the Stewart-Weir Report may be excessive. The Board believes that a corridor which could accomodate thirty or more pipelines with a lesser spacing than those recommended in the Stewart-Weir Report would be more acceptable. The Board is of the view that a corridor width of 400 feet would be more in the public interest, taking into account such factors as landowner interests, pipeline design and operating parameters, forecasts of likely number of pipelines, public safety, and economics.

The Board emphasizes that this conclusion reflects its view that the corridor in question is a very special situation where a large number of expected pipelines, combined with a highly developed urban area, dictates closer spacing and greater controls related to pipeline construction and operation than might otherwise occur in a less intensive industrial and urban development area.

7 OTHER MATTERS

Although not mentioned directly in the Order in Council, some additional items were raised during the inquiry which the Board believes should be commented upon.

7.1 Acquisition of Lands

7.1.1 Views of Participants

Although landowners did not take a strong position on the matter of land acquisition, it was clear that they were expecting the lands to be acquired in full as an outcome of this corridor inquiry.

The strongest comments regarding land acquisition were made by the pipeline companies and their position was unanimous. It would clearly be to the pipeline operators' advantage to have a pipeline corridor where the route was known, so that the companies would be able to gain entry to the corridor without lengthy regulatory deliberation. The unanimous position of those who addressed this issue was that the Government should acquire the land on the preferred corridor route. A number of participants also suggested that the Government should, as a prelude to acquiring the lands in question, declare the corridor as a Restricted Development Area or a Special Planning Area. It was pointed out that acquisition of the corridor lands was a necessary step in fairness to the landowners. This view of the pipeline companies was consistent with that expressed in the Stewart-Weir Report.

7.1.2 Views of the Board

Although the Board was not requested by the Government to comment on this aspect of the problem it does offer the following general views:

1. The Board believes that the lands in question should be declared a Restricted Development Area or Special Planning Area as soon as practical in order to make clear to the pipeline industry and landowners the intended location of future pipelines, and to reduce future regulatory delays and related costs.

2. The Board believes that acquisition of the total corridor at the outset would be appropriate and in particular fair to current landowners. On the other hand, the Board does not believe that the acquisition of land must necessarily be by the Government. Since this corridor would represent a pipeline corridor only, the Board believes it possible that the pipeline industry could, either through one company or a consortium, acquire the lands in question. In this regard, the Board notes

that AEC, Shell and NUL stated that they were prepared to acquire land in the designated corridor for their proposed pipelines with the understanding that the land be assigned to the corridor when the full corridor width was acquired.

7.2 Corridor Administration

The Board also heard recommendations respecting corridor management and operations. Evidence from Mr. Weir suggested that the management and operation of the corridor could well be undertaken by a consortium of pipeline companies, and in fact this was his recommendation. This view also appeared to be shared by the pipeline companies who spoke to the matter. Shell, however, suggested a form of corridor management by the Board, with the operations being handled by the corridor users.

The Board is in general agreement with the recommendation that the corridor should be managed and operated by the pipeline industry. The Board believes that these responsibilities could best be handled by those who are operating the pipeline systems on a day-to-day basis.

Regarding the matter of regulatory administration, the Board believes that it could be resolved through normal Board processes when required. However, it is the opinion of the Board that the pipeline companies who would operate in a corridor environment would be required to assume responsibility with regard to such things as pipeline spacing, line sequencing, right of way access, leasing arrangements, and other contractual matters.

7.3 Corridor Safety

7.3.1 Views of Participants

A number of submittors either were concerned about or commented upon the safety aspects of the various pipeline transportation corridors that were proposed.

Canada Cement had grave misgivings about the risk of pipeline damage that could occur should a 600-foot wide corridor intrude upon its gravel mining operations. This was quite apart from the fact that approximately half of the gravel now available to the company would be lost.

Mr. Weir, under cross-examination, expressed concerns about the safety of pipelines in the corridor should water or sewer lines be allowed in the same corridor. He was of the opinion that the corridor should be reserved only for oil or gas pipelines, but stated that there could be pressure from other utilities to be allowed to use the space. Still on the subject of safety, Mr. Weir commented that one attribute of his preferred route was the fact that there would be less likelihood of third-party damage because it would be more remote from outside activities. This latter viewpoint was supported by Genstar.

Shell contended that the safety requirements for the pipeline corridor could best be handled by Board regulations, and argued against the need for any new operating authority to be formed, as suggested in the Stewart-Weir Report.

The AEC-Shell-NUL consultants' report outlined three specific aspects of pipeline safety in a corridor; the indigenous safety of each line, safety from adjacent pipelines, and safety from human activities. The report stated that specific pipeline safety is adequately covered by existing design codes and regulations. Safety from adjacent lines could be looked after primarily by proper spacing, depth of cover, and choice of pipe materials. Safety from human activity involved such matters as control of construction work adjacent to and across existing lines, and awareness of potential ground loading over the lines. Mr. Ursenbach, one of the authors of the report, also commented on the matter of setback distances from corridor boundaries. He stated that in his opinion such setbacks were unnecessary, since the grouping of pipelines in a corridor made their location much more identifiable, and control and security of the right of way was easier than for single isolated lines.

Although Mr. Weir stated that a multiple pipeline tunnel under the Canadian National Railway marshalling yards posed no safety hazard, AGEC brought forward a number of concerns about the maintenance and repair of pipelines within the tunnel, and the potential hazard that would exist if a pipeline leak or break were to occur.

7.3.2 Views of the Board

The Board believes that a corridor set aside exclusively for the use of oil and gas pipelines with no other utilities located within the right of way, and properly protected from intrusion by outside activities, would be acceptable from a safety viewpoint. Stringent surveillance by the respective pipeline companies or the corridor management, close control of adjacent pipeline construction, and application of proven design criteria would all contribute to the safety aspect, and the Board is of the opinion that these goals can be met in a properly designed and managed pipeline corridor.

8 RECOMMENDATIONS

8.1 Route

The Board recommends that the route shown on Figure 6 be adopted as a pipeline corridor from the Sherwood Park West and Edmonton Restricted Development Areas north of the Canadian National Railway marshalling yards to a point near Highway 21.

8.2 Corridor Width

The Board recommends that the width of the corridor be established at 400 feet.

ISSUED at Calgary, Alberta, on 27 October 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy, P.Eng.
Vice Chairman

V E Bohme

V. E. Bohme, P.Eng.
Board Member

N Strom

N. Strom, P.Eng.
Board Member

APPENDIX I

THOSE WHO APPEARED AT THE INQUIRY

Principals and Representatives (Abbreviations used in Report)	Witnesses
Alberta Energy Company Limited (AEC) D. R. Thomas	R. A. Nemeth, P.Eng. G. R. Ursenbach, P.Eng. J. E. Ellefson, P.Eng. J. H. Russell, P.Eng.
The Alberta Gas Ethylene Company Ltd. (AGEC) H. D. Williamson	
Canada Cement Lafarge Limited (Canada Cement) R. A. M. Young	W. Sydoryk M. J. Johnson
Canadian Petroleum Association (CPA) J. A. Lawrence	
City of Edmonton Ms. M. McAvoy W. Cameron	
County of Strathcona No. 20 (County) M. C. Welsh	
Daon Development Corporation (Daon) T.W. Gallant	
Dome Petroleum Limited (Dome) W. G. Loewen	
Edmonton Regional Planning Commission (ERPC) Ms. B. Fricson	
Genstar Development Company (Genstar) E. J. Walter	
Imperial Oil Limited and Esso Resources Canada Ltd. (Imperial and Esso) R. Gaetz	P. Reimer, P.Eng.

THOSE WHO APPEARED AT THE INQUIRY (Continued)

Principals and Representatives (Abbreviations used in Report)	Witnesses
Donald F., Helen and Richard Jackson D. F. Jackson	
Johannes Prinz Von Thurn und Taxis V. Schwab, Q.C. I. F. Grape	D. H. Brackley, B.A.
Northwestern Utilities Limtied (NUL) B. Zalmanowitch	E. L. Provost, P.Eng.
Ram Holdings Co. Ltd. H. N. Bowker J. Agrios	
Shell Canada Limited (Shell) R. M. Curtis	R. J. LaMarre, P.Eng.
Stewart, Weir, Stewart, Watson, Heinrichs & Dixon (Stewart-Weir) A. L. McLarty	C. H. Weir, P.Eng.
Thickwood Holdings Alberta Ltd. (Thickwood) Mr. Gillespie	
Turbo Resources Limited (Turbo) C. Kennedy B. Hunt	L. Liebel
Albert, Arthur and Clara Van Hecke A. Van Hecke	
Energy Resources Conservation Board staff (Board staff) R. J. Allman, P.Eng. M. J. Bruni G. C. Dunn, P.Eng.	

Consor Builders Ltd., Len Perry Homes, McQuarrie Investments Ltd., and Art Staniland Investments Ltd., tendered a submission but did not appear at the Inquiry.

Mr. Gallant and Mr. Walter withdrew their respective submissions during the Inquiry.

Thickwood Holdings Alberta Ltd. made no written submission but appeared as an interested party.

APPENDIX II

ORDER IN COUNCIL

APPROVED AND ORDERED.

XXXXXXXXXXXXXXXXXXXX
Administrator

O.C. 545/81

June 17, 1981

EDMONTON, ALBERTA

WHEREAS the Government of Alberta is aware that several pipelines are currently being proposed in the northeast Edmonton - Fort Saskatchewan area and that over the next decade or so a substantial number of additional pipelines will probably be required in this area; and

WHEREAS having regard for the extent of urban and industrial development currently taking place and expected in the future in this area, the Government of Alberta is of the view that the establishment of a pipeline corridor in this area would have significant advantages; and

WHEREAS the Government of Alberta believes that the existing Sherwood Park West and Edmonton Restricted Development Areas must be utilized to the maximum extent possible for the location of pipelines and therefore it has been decided that any pipelines entering or leaving northeast Edmonton must do so north of the Canadian National Railway marshalling yards:

THEREFORE, upon the recommendation of the Honourable the Minister of the Environment, the Lieutenant Governor in Council, pursuant to section 24(1) of The Energy Resources Conservation Act, requests the Energy Resources Conservation Board to make inquiries into and report on:

(a) the most desirable route for a pipeline corridor from the Sherwood Park West and Edmonton Restricted Development Areas north of the Canadian National Railway marshalling yards to a point near Highway 21, and

(b) the width of a corridor that would be appropriate having regard for future pipeline requirements in the area.

CHAIRMAN

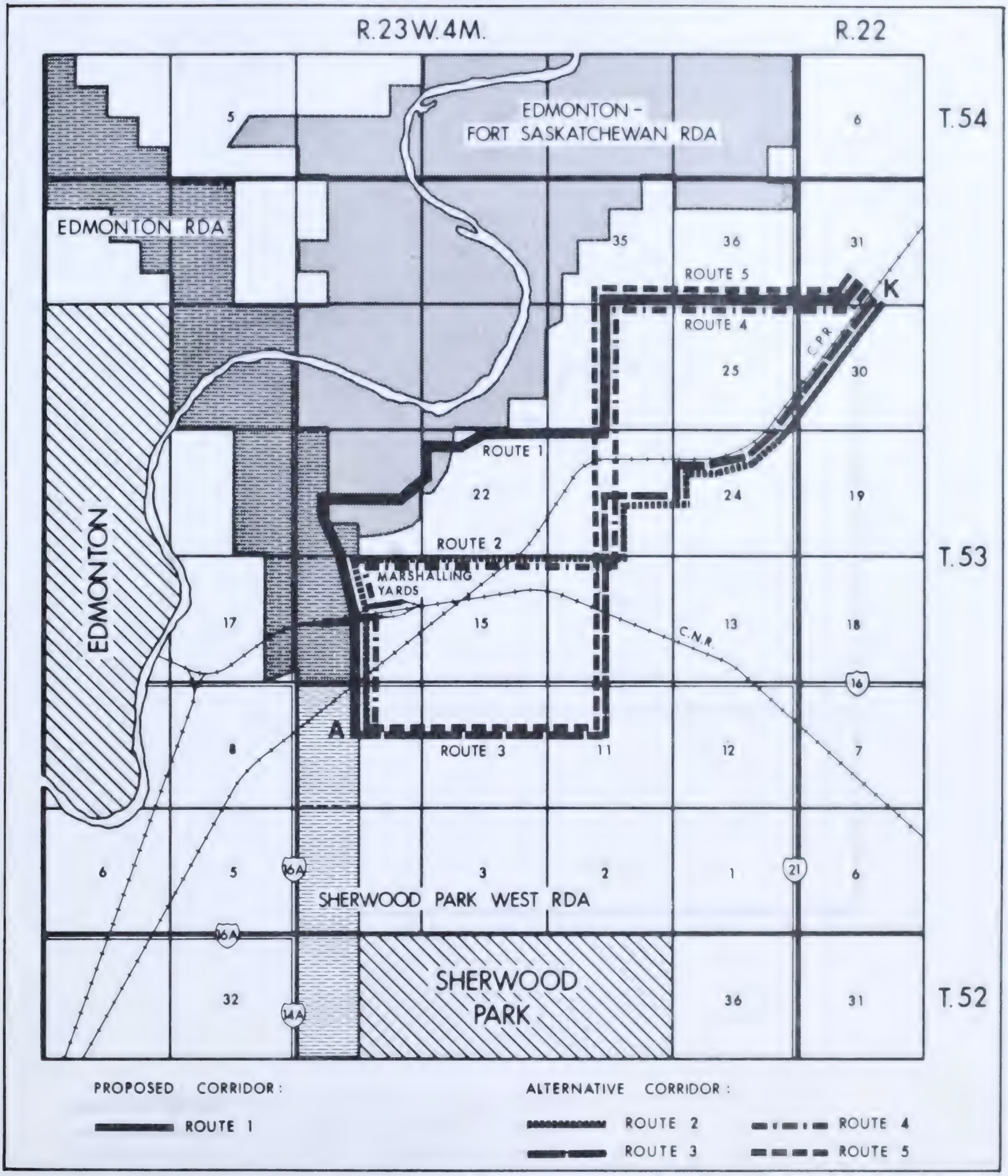

FIGURE 1 PROPOSED AND ALTERNATIVE CORRIDOR ROUTES
NORTH - EAST EDMONTON AREA
STEWART - WEIR REPORT

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

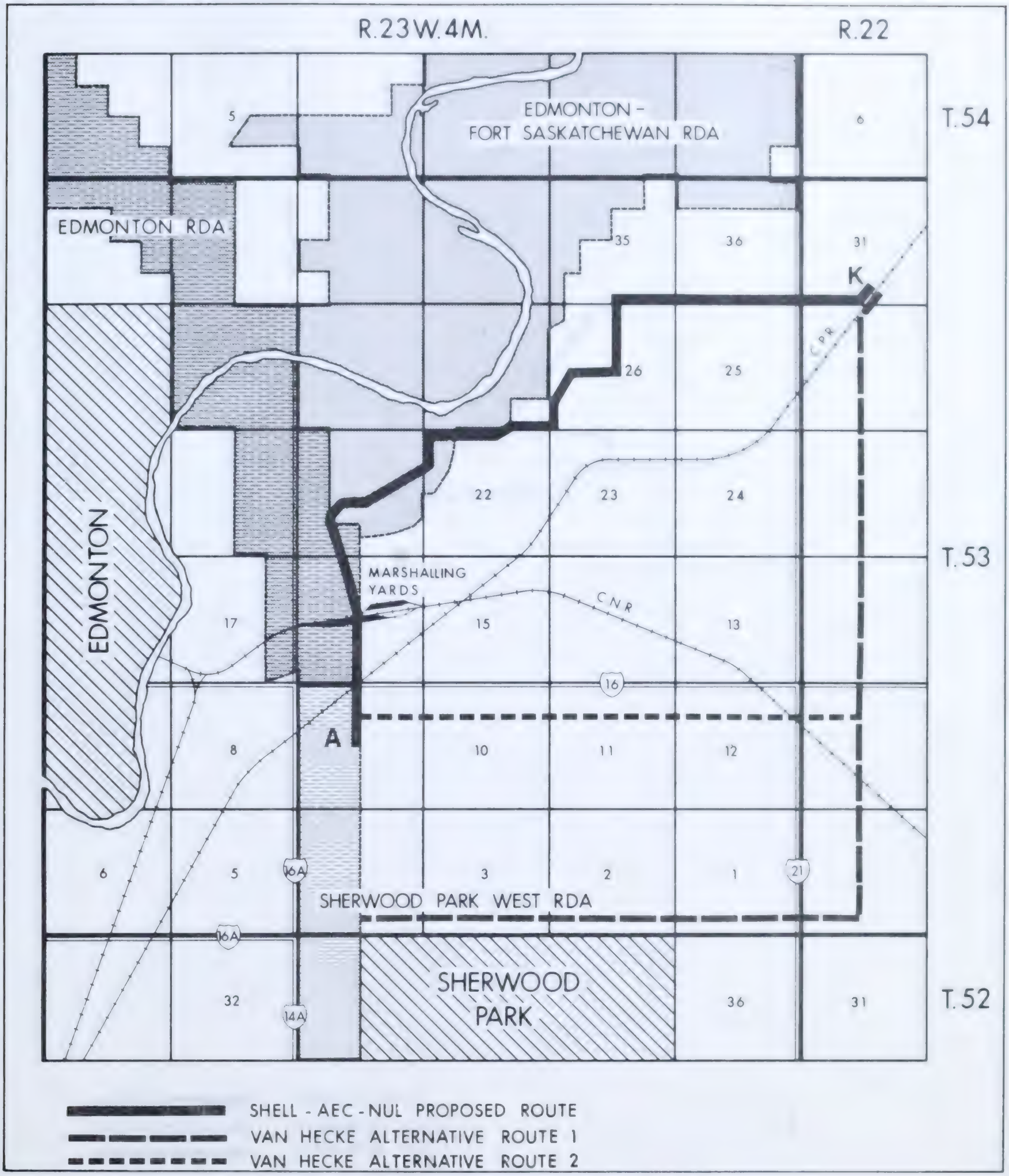

FIGURE 2 PROPOSED AND ALTERNATIVE CORRIDOR ROUTES
NORTH-EAST EDMONTON AREA
SHELL, A.E.C., N.U.L. JOINT REPORT
ALBERT, ARTHUR & CLARA VAN HECKE

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

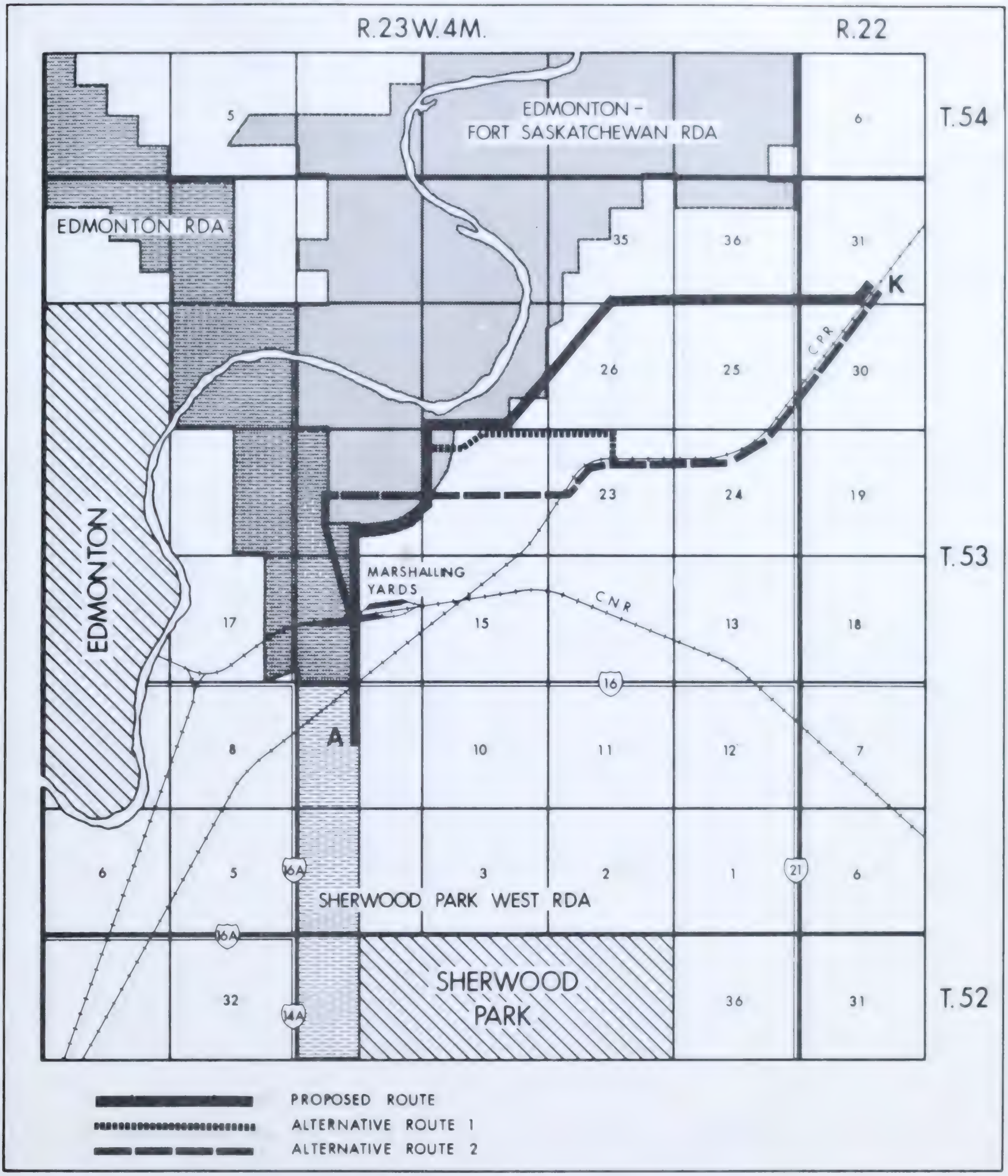

FIGURE 3 PROPOSED AND ALTERNATIVE CORRIDOR ROUTES
NORTH-EAST EDMONTON AREA
EDMONTON REGIONAL PLANNING COMMISSION

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

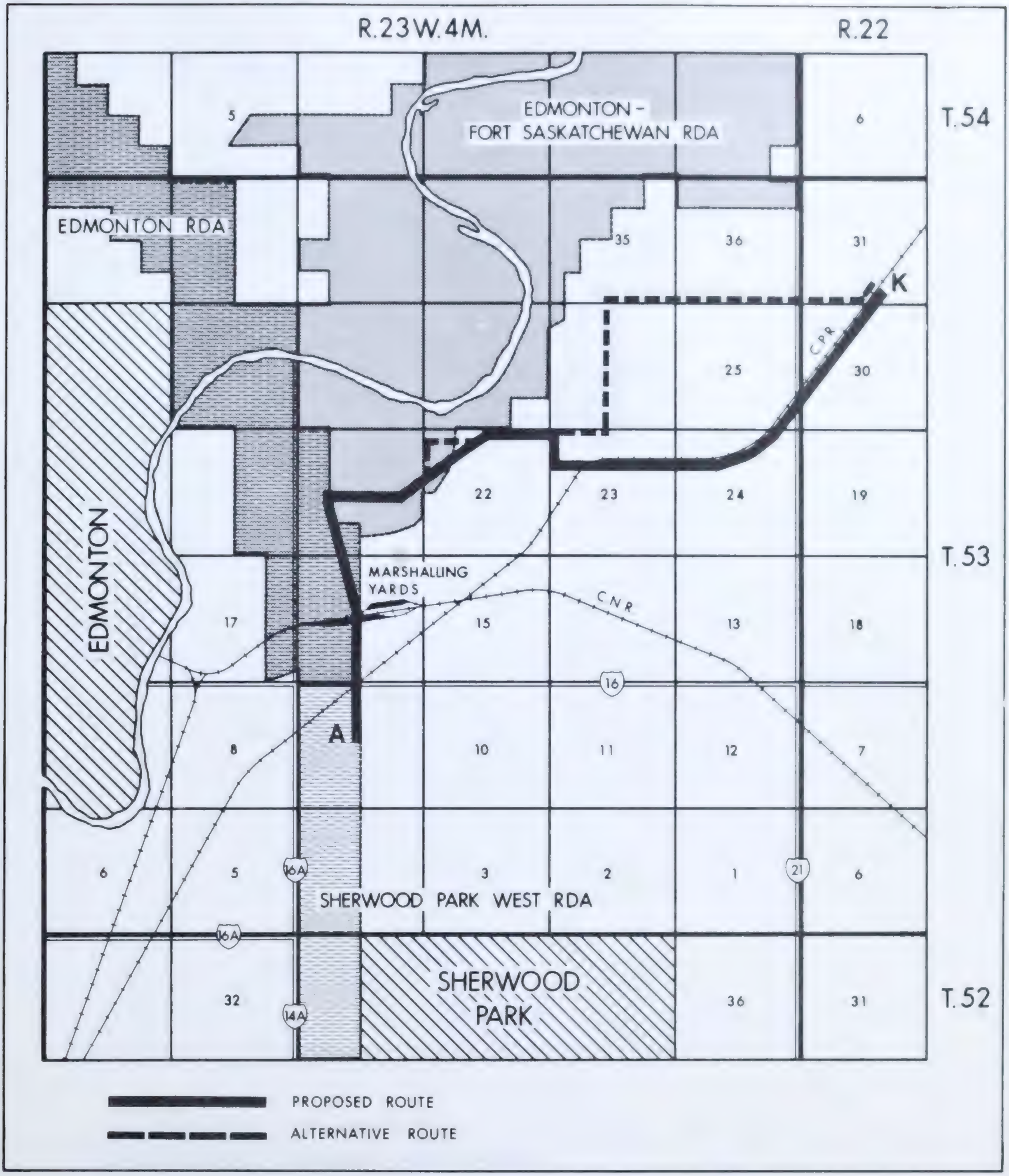

FIGURE 4 PROPOSED AND ALTERNATIVE CORRIDOR ROUTES
NORTH-EAST EDMONTON AREA
CITY OF EDMONTON

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

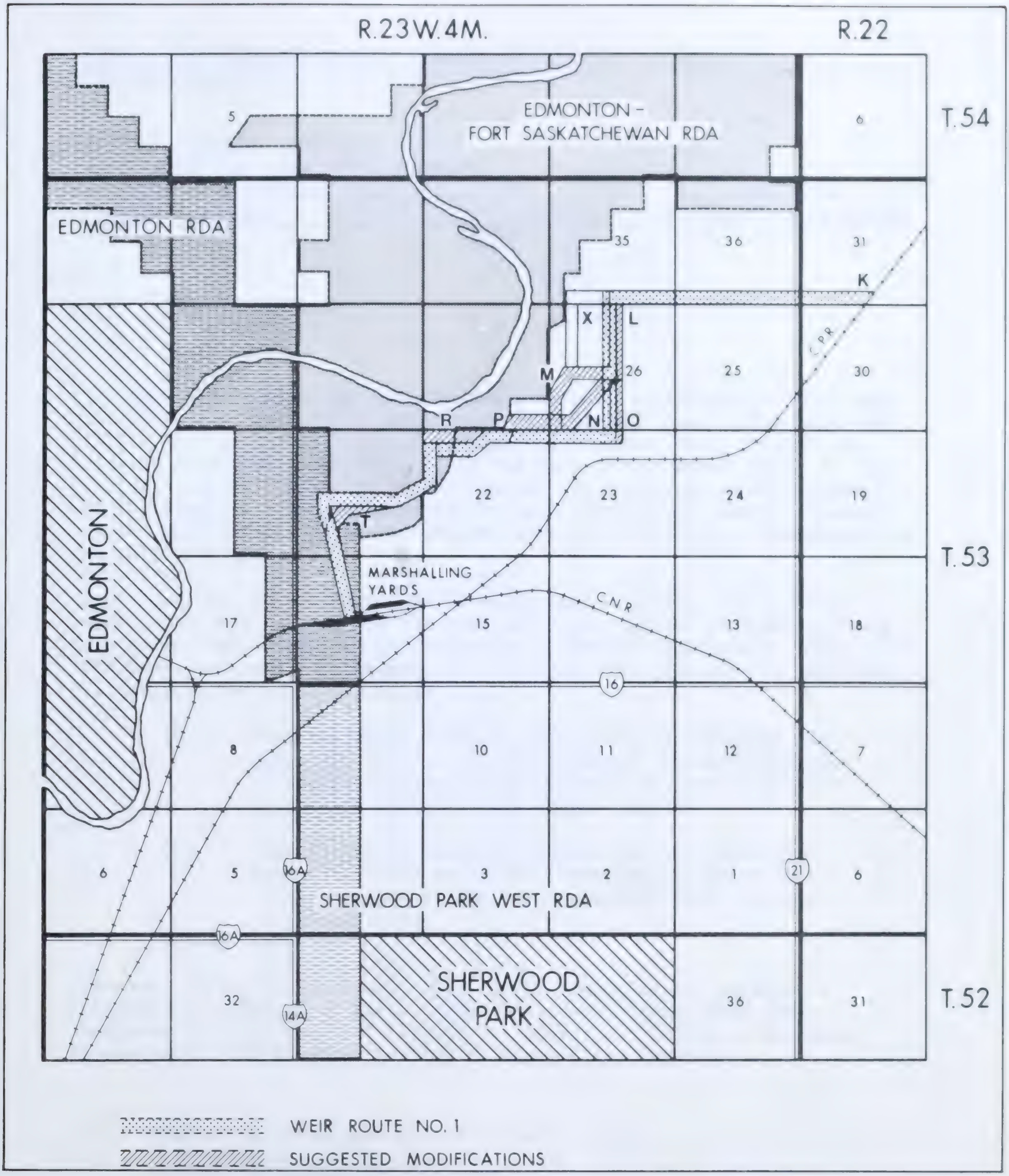

FIGURE 5 STEWART - WEIR REPORT PREFERRED CORRIDOR ROUTE PLUS MODIFICATIONS

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

ALBERTA PRODUCTS PIPE LINE LTD.
APPLICATION FOR PERMIT TO CONSTRUCT
SEGMENTS OF A PIPELINE NEAR
CALGARY AND LEDUC

Decision 81-31
Application 810759

1 INTRODUCTION

1.1 Background

The segments of pipeline under review form part of a pipeline which was the subject of an earlier application by Alberta Products Pipe Line Ltd. (APPLE) and which the Energy Resources Conservation Board (Board) considered at a public hearing held in Red Deer in September 1980. In its decision report[1] the Board granted Permit 18419 for the major portion of the pipeline after considering the need, design, and safety aspects of the application, and these factors were not subjects for consideration at this hearing.

Subsequently, the applicant was informed that notice of the initial application and hearing had not been served to certain landowners along the route, and it applied to the Board to rescind portions of Permit 18419. The Board approved the request and rescinded those portions of the permit relating to the following lands:

(a) from the south boundary of section 18, township 24, range 28, west of the 4th meridian, thence northerly to the north boundary of township 25, range 28, west of the 4th meridian (see Figure 1), and

(b) from the south boundary of township 49, range 25, west of the 4th meridian, thence northerly to the north boundary of the said township, (see Figure 2).

1.2 The Application

Pursuant to The Pipeline Act, 1975, APPLE reapplied for permits to construct a pipeline in the original alignment across those lands referred to in section 1.1 (a) and (b) above, and relied on evidence presented at the previous hearing to support its application.

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[1] Energy Resources Conservation Board, 1980
Alberta Products Pipe Line Ltd.
Permit to Construct a Pipeline
from Edmonton to Calgary.
ERCB Decision Report 80-30
Calgary, Alberta.

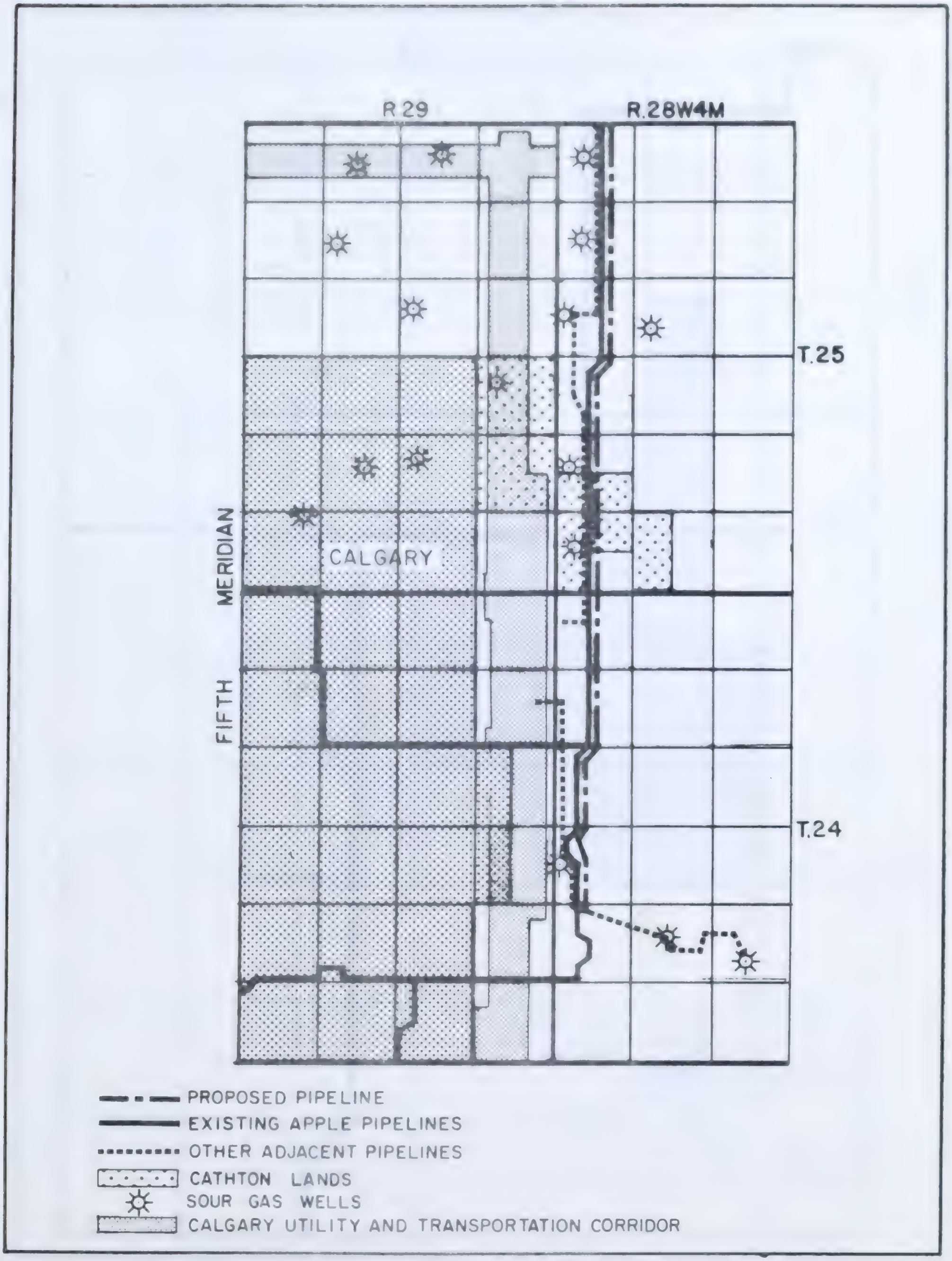

FIGURE 1 – CATHTON LANDS

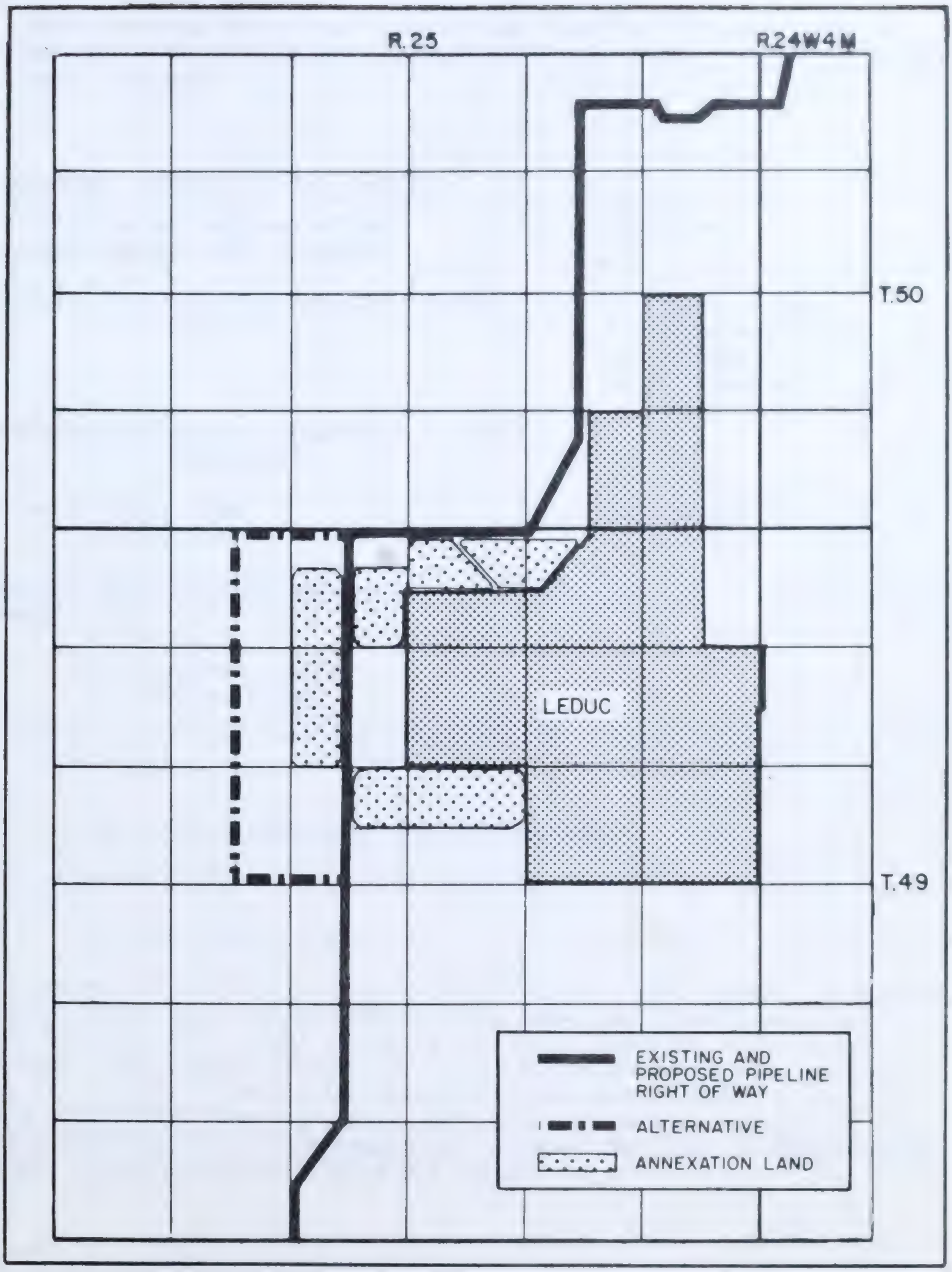

FIGURE 2— TOWN OF LEDUC AREA

1.3 The Hearing

A public hearing of the application took place on 21 October 1981 in Edmonton, with G. J. DeSorcy, P.Eng., N. Strom, P.Eng., and R. G. Evans, P.Eng., sitting.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Alberta Products Pipe Line Ltd. (APPLE) J. D. Anderson	H. Feasby, P.Eng. R. E. Gunson, P.Eng. J. A. Lawrence G. R. Ursenbach, P.Eng.
Cathton Holdings Ltd. (Cathton) K. D. Wakefield	
Town of Leduc (Town) J. Hilliard	J. Hilliard
Energy Resources Conservation Board staff K. Miller R. J. Allman, P.Eng. A. Cassley, P.Eng.	

2 THE SOUTH SEGMENT (CATHTON HOLDINGS LTD.)

The affected lands are described in section 1.1 (a) and shown in Figure 1.

2.1 The Applicant's Views

In support of its application for the original route through the Cathton lands, APPLE said that because of other pipelines closely parallelling the existing APPLE right of way, a "de facto" pipeline corridor now exists. The company stated that it did not apply for a pipeline route in the Calgary RDA utilities corridor because the corridor is only in the preliminary planning stages and subject to change, and pointed out that the Minister of Environment had approved the route in the original right of way when Permit 18419 was issued.

The applicant contended that locating the pipeline in the Calgary RDA utilities corridor would involve extra costs for right of way in the order of one million dollars, and the relocation of a diversion station at an estimated cost of $100 000 to $150 000. APPLE further argued that locating the pipeline in the RDA alignment would involve crossing a number of sour gas gathering systems, thereby negating one of the major design objectives of the original route - namely to avoid interference with existing sour gas facilities.

To clarify a possible misunderstanding by Cathton, the applicant stated that its undertaking to relocate its existing pipeline into an RDA was not intended to apply to this application but only to the area immediately south of Edmonton.

2.2 Cathton's Views

In its submission Cathton claimed that the purpose of the Calgary RDA transportation and utility corridor was for the location of pipelines such as the one proposed by APPLE, and that it made sense to locate the proposed pipeline in such a corridor as opposed to an area in which future residential and commercial development is likely to take place.

Cathton pointed out that APPLE had only single-line rights on parts of the proposed route, and claimed that the obtaining of multiple-line rights on these lands could prove difficult and costly.

2.3 The Board's Views

The Board notes that more Cathton land would be affected by a pipeline route in the proposed transportation and utility corridor in the RDA than along APPLE's existing right of way.

The Board further believes that Cathton did not present any compelling planning evidence to support its request for refusal of the applied-for route.

The Board therefore concludes that an alignment in the existing right of way is optimum and should be approved.

3 THE NORTH SEGMENT (TOWN OF LEDUC)

The affected lands are described in section 1.1 (b) and are shown in Figure 2.

3.1 The Applicant's Views

The applicant stated that in planning the original APPLE route in the Leduc area in 1969 and 1970 the company had consultations with the Town planners which resulted in the chosen route deviating from the route of the then existing Rimbey line which is approximately 6 km east of the Town. The Town was satisfied at that time that APPLE chose the best route, and the factors that were influential in reaching that decision still remain valid. The applicant contended that the problem of urban encroachment relating to pipelines is not solved by shifting pipelines, but that mechanisms exist to include the pipelines in sound planning, and that the Town could accommodate the proposed pipeline with no detrimental effects to the Town plan. APPLE estimated the additional cost of the alternative route at $350 000, excluding the purchase of new easements.

3.2 Town of Leduc's Views

The Town indicated that its plans for growth involved an annexation area to the west of the existing Town boundaries which was traversed by the existing APPLE pipeline right of way, and to which would be added the proposed pipeline. The Town expressed some concern about possible zoning requirements in the form of density or setback requirements for land adjacent to the right of way.

The Town stated its needs for a large area on the west side of Highway 2, and noted that this area will most likely not be needed for development before the year 2001. With respect to the alternative route indicated by the applicant, the Town stated that it was not willing to purchase right of way for the route, and in fact was unaware that an alternative route had been proposed.

3.3 The Board's Views

The Board believes that the location of the proposed pipeline in a right of way other than the existing APPLE right of way would be premature and may lead to further planning problems in the future. Even though the pipeline is proposed to be located in the future annexation area of the Town, the planning and timing of which are flexible, the Board is of the view that the impact of a second pipeline in the same right of way as an existing pipeline is less than would result from a more westerly alternative route. The Board also notes that a second line in the existing right of way, as proposed by the applicant, would be considerably less costly.

4 DECISION

The Board grants the application by Alberta Products Pipe Line Ltd. to construct a pipeline on the applied-for route through township 49, range 25,W4M and from the south boundary of section 18-24-28 W4M to the north boundary of township 25, range 28, W4M. The Board is prepared to issue permits for the construction subject to the approval of the Minister of Environment pursuant to section 8 of The Pipeline Act, 1975, and subject to the consent of the Minister of Environment, pursuant to the Calgary Restricted Development Area Regulations.

ISSUED at Calgary, Alberta, on 24 November 1981.

ENERGY RESOURCES CONSERVATION BOARD

G J DeSorcy

G. J. DeSorcy
Vice Chairman

N. Strom
Board Member

R G Evans

R. G. Evans,
Acting Board Member

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

APPLICATION TO REINSTATE WELL
LICENCE NO. 90345 HOLMBERG FIELD

Decision 81-32
Application 810690

The Board has reviewed the report of its examiners, attached hereto, respecting Application 810690 for a licence to drill a well in the Holmberg area.

For purposes of its decision, the Board adopts the examiners' recommendations.

The Board also wishes to bring to the attention of industry the Board's policy with respect to evidence respecting the surface location of a well site, to be heard at hearings of applications for well licences. The Board expects that applicants for well licences will have conducted negotiations regarding the surface location with the affected landowner and will be prepared to give evidence as to the extent of these negotiations, should a hearing be necessary. Where a hearing occurs and where a landowner objecting to the applicant's proposed well location has suggested an alternative location, the Board expects the applicant to present evidence respecting the location suggested by the landowner.

DATED at Calgary, Alberta, this 24th day of November 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy
Vice Chairman

Attach.

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

APPLICATION BY PANTHER RESOURCES LTD.
TO REINSTATE WELL LICENCE NO. 90345 Examiners' Report E81-32
HOLMBERG FIELD Application 810690

1 INTRODUCTION

1.1 Background

On 27 May 1981, Panther Resources Ltd. (Panther) applied to the Energy Resources Conservation Board (the Board) for a well licence to drill PANTHER ET AL HOLMBERG 6-16-45-18 (6-16 well) located in Legal Subdivision 6 of Section 16, Township 45, Range 18, West of the 4th Meridian, for the purpose of obtaining production from zones down to the Wabamun Group. It was indicated on Panther's well licence application that the surface owner, Mr. Donald H. McGowan (Mr. McGowan) had agreed to the location of the well. Well Licence No. 90345 was issued to Panther on 28 May 1981.

On 9 June 1981, Panther presented the original signed copy of a Landowner Contact Report dated 20 May 1981, to the Board staff along with a copy of the letter of objection to the well from the surface owner's legal counsel. The Landowner Contact Report, an internal form used by Panther, stated that the undersigned granted permission to do survey work and acknowledged agreement with the proposed route as shown on the sketch. Panther alleged that this report, which had been signed by the surface owner, Mr. McGowan and the occupant, Mr. Mirrel Nelson, indicated the surface owner's and occupant's agreement to the surface location of the 6-16 well.

The Board subsequently received a formal notice of objection, dated June 8, 1981, to the location of the above well from Mr. McGowan. In this letter, Mr. McGowan indicated that Panther had advised him that the 6-16 well had to be situated in the area indicated on the survey and could not be relocated to any other site. Mr. McGowan requested a hearing be held pursuant to Section 41 of The Energy Resources Conservation Act.

The Board requested that further negotiations continue in the form of an on-site meeting with Panther, the surface owner and Board staff present. On 25 June 1981, an on-site meeting was attended by Panther, Mr. McGowan and Board staff. All attempts to resolve the remaining problems regarding the surface location of the well were unsuccessful. On 8 July 1981, Mr. McGowan filed the formal notice of objection to the proposed location citing disruption to land use as the reasons for the objection. On 10 July 1981, Well Licence No. 90345 for the 6-16 well was suspended indefinitely pursuant to section 31(a) of The Oil and Gas Conservation Act.

1.2 The Application

On 26 August 1981, Panther applied for reinstatement of Well Licence No. 90345. Because no agreement had been reached with Mr. McGowan, the application for reinstatement was set down for a public hearing.

1.3 The Hearing

On 29 September 1981 at Camrose, Alberta, a public hearing of the application was held before examiners appointed by the Board. The examiners were L. A. Bellows, P.Eng., G. H. Fairbanks, P.Geol., and N. J. Duncan, P.Eng.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives	Witnesses
Panther Resources Ltd.	J. Armstrong
D. H. McGowan G. R. Knaut, Q.C.	D. H. McGowan
Energy Resources Conservation Board staff G. D. Agnew M. Semchuck	

2 THE ISSUES

The examiners consider the issues related to the application to be:

- the need for a well,
- the surface location of the proposed well,
- the impact of the proposed well on the surface land use.

3 THE NEED FOR THE WELL

3.1 The Applicant's Views

Panther's submission stated that it has a right to exploit its mineral rights and that it has a market for gas from the land in question through a contract with "Alberta and Southern". The submission further stated that Panther has an active development program in the area and that Panther was prepared to drill the proposed location.

3.2 The Intervener's Views

The intervener did not dispute that Panther is entitled to win the minerals on lands for which it holds or has an agreement to acquire the mineral rights.

3.3 The Examiners' Views

The examiners believe that a well, drilled somewhere on the lands in question, is required to determine whether reserves of gas are present.

4 THE SURFACE LOCATION OF THE PROPOSED WELL

4.1 The Applicant's Views

Panther's written submission stated that its expenditures have been based on detailed geologic subsurface studies and that the company's performance is dictated by extremely critical analysis of all information at its disposal. It further states that this play is critical to one legal subdivision, that Panther would not drill one legal subdivision away from its preferred location, and that Panther objects to directional drilling where there is no demonstrated need. The written submission did not specify the detailed geologic subsurface studies or the critical analysis applied to the site selection.
Mr. Armstrong, Panther's only representative at the hearing, stated that he had been retained by Panther on 24 September 1981 and could not provide any information on the geology of the area or the specific reasons why the proposed well site was selected. He had not met with Mr. McGowan nor had he examined the proposed site. Mr. Armstrong stated that Panther was not prepared to consider any alternative well sites.

4.2 The Intervener's Views

The intervener stated the location proposed by the applicant would cause interference to the farming operations carried on in the southwest quarter of Sec 16. The proposed 6-16 well site and access road would remove from production valuable agricultural land and would create an unnecessary headland. The intervener suggested three alternative well sites and access roads to the one proposed by the applicant, (see Figure 1). A fourth alternative location was considered and discussed during the course of the hearing.
The intervener's first preference, in the extreme southwest corner of Lsd 4 would result in the least effect on farming operations. There would be virtually no access road with such a location. Mr. McGowan acknowledged this location would not be considered by the applicant as it would not be within the prescribed target area for one section spacing. For his second preference in the extreme northeast corner of Lsd 6, the access road could run parallel to the north boundary of Lsds 5 and 6 and thus avoid interruption of existing farming patterns. The

third preference in the southerly portion of Lsd 6 would remove approximately one less acre (0.4 ha) of farmland than the location proposed by the applicant. The associated access road would follow the approximate route that was proposed by Panther in its original application. The fourth preference was directly north of the proposed location. The access road would be similar to the one outlined in the intervener's second preference.

4.3 The Examiners' Views

The examiners note that the proposed site is in the secondary target area and that the landowner's second alternative location is in the primary gas target area as designated in Board Order SU 1088. The examiners believe that, when the landowner prefers a location within the primary target area, the applicant must provide evidence of the necessity to drill in the secondary target area.

The examiners note the applicant's intention to drill the 6-16 well only at the licenced location. However, as there was no specific evidence provided to show the geologic limitations in selecting a surface location, the examiners believe that relocation to several other potential sites within the existing drilling spacing unit target area may be possible.

5 IMPACT OF THE PROPOSED WELL SITE ON THE SURFACE LAND USE

5.1 The Applicant's Views

The applicant did not comment on the impact the proposed well may have on the surface land use.

5.2 The Intervener's Views

The intervener stated he would prefer to see the proposed well site located on the perimeter of his fields, thus ensuring that the well site and access road would have a minimal impact on the existing farming operations. The second and fourth alternative locations would provide Panther with the advantage of minimum access road to construct and maintain. The intervener stated that if the third alternative location was to be considered, the applicant would have to install culverts in the access road in strategic locations to handle runoff water and alleviate potential problems of soil erosion.

The intervener concluded that there was no information presented which specified that a significant degree of geologic flexibility was absent in the southwest quarter of 16-45-18 W4M. Therefore the intervener was of the opinion that consideration should be given to the alternative locations that would reduce the degree of impact to the present surface land use.

5.3 The Examiners' Views

The examiners note that the applicant did not specify geologic restrictions which may preclude relocating the well site nor did it address the effect such relocation may have on the well's chance of success. In the absence of evidence supporting the need to drill only at the licensed location, the examiners believe that other locations as proposed at the hearing that may reduce the impact on surface land use, should have been considered in consultation with the landowner.

6 FINDINGS

The examiners find that

- there is a need for a well to determine whether gas reserves are in place in Section 16-45-18 W4M,
- there is no evidence to indicate that the surface location of the proposed well cannot be varied,
- there appear to be alternative surface locations that would reduce the impact on surface land use and probably should have been considered in consultation with the landowner.

7 RECOMMENDATIONS

The examiners recommend that the Board deny the application by Panther Resources Ltd. to reinstate the licence for the well, PANTHER ET AL HOLMBERG 6-16-45-18 W4M. The examiners further recommend that the Board cancel Well Licence No. 90345.

DATED at Calgary, Alberta, on 30 October 1981.

L A Bellows

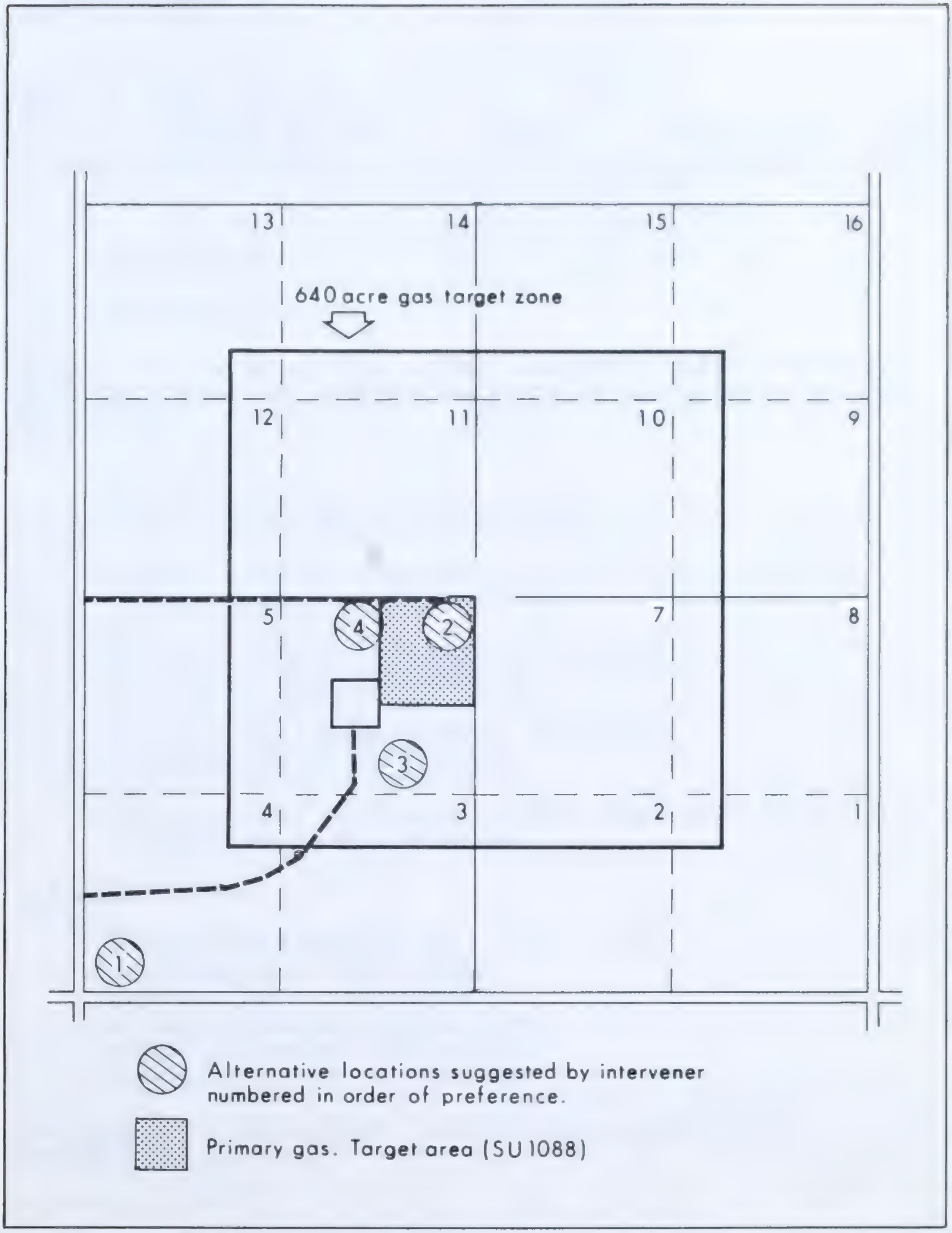
L. A. Bellows, P.Eng.

G H Fairbanks

G. H. Fairbanks, P.Geol.

Duncan P.Eng

N. J. Duncan, P.Eng.


13
14
15
16
640 acre gas target zone
12
11
10
9
5
4
2
7
8
3
4
3
2
1
1
Alternative locations suggested by intervener numbered in order of preference.
Primary gas. Target area (SU 1088)

PANTHER et al HOLMBERG 6-16-45-18W4M PROPOSED WELL SITE

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

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ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

NOVA, An Alberta Corporation
Permit to construct the Liege
Lateral and Meter Station

Decision Report 81-33
Application 810600

1 INTRODUCTION

1.1 The Application

NOVA, An Alberta Corporation applied, pursuant to The Pipeline Act, 1975, for a permit to construct the following facilities to transport natural gas:

69.7 km x 273.1 mm OD Liege to Saleski Jct
Lsd 6-29-92-20 W4M to 16-31-86-18 W4M

5.2 km x 114.3 mm OD Saleski to Saleski Jct
7-10-86-18 W4M to 16-31-85-18 W4M

25.4 km x 273.1 mm OD Saleski Jct to Granor
16-31-85-18 W4M to 6-24-83-18 W4M

20.7 km x 323.9 mm OD Granor to Boivin Creek
6-24-83-18 W4M to 6-24-83-18 W4M

33.8 km x 323.9 mm OD Boivin Creek to House River meter station
4-1-82-17 W4M to 8-33-79-14 W4M

and meter stations:

at Liege Lsd 6-29-92-20 W4M
at Saleski Lsd 7-10-86-18 W4M
at Granor Lsd 6-24-83-18 W4M
at Boivin Creek Lsd 6-1-82-17 W4M
at House River Lsd 8-33-79-14 W4M
at Atmore "C" Lsd 1-32-67-17 W4M

The location of the proposed lines and meter stations are shown in the attached map, Figure 1.

In March 1981, Pan-Alberta Gas Ltd. requested facilities to transport new volumes of natural gas from the Liege, Saleski, Granor and Boivin Creek areas. At present, no facilities capable of handling these volumes exist in the area. A number of producers are, or will be, installing compression facilities in the area. Approval of the proposed pipeline facilities was requested by NOVA, An Alberta Corporation, to transport these volumes of natural gas to the Simmons Pipeline, to be exchanged for equivalent volumes to be delivered to NOVA at Atmore on the existing NOVA system.

1.2 The Hearing

The application was considered, along with Application 810576, at a public hearing on 18 November 1981 in Calgary, Alberta, with G. J. DeSorcy, P.Eng., V. E. Bohme, P.Eng. and F. Trofanenko (a member of the Public Utilities Board who was appointed as an acting Board member) sitting. Those who appeared at the hearing are listed in Table 1. Application 810576 is being dealt with in a separate report.

2 THE ISSUES

The Board considers the principal issues of this application to be

- Purpose and Necessity
- Technical Considerations
- Suitability of the Route

3 PURPOSE AND NECESSITY

Views of the Applicant

NOVA stated that Pan-Alberta had contracted to purchase volumes of gas in the Leige area and had requested NOVA to provide suitable facilities to transport the gas to a marketing point. The gas would be delivered to the existing Simmons Pipeline system and exchanged for equivalent volumes at Atmore.

NOVA supplied the Board with a comprehensive reserves and deliverability study indicating that substantial quantities of gas exist in the area to be served by the pipeline. The reserves in the subject area were estimated by a NOVA consultant to total some 16 billion cubic metres. He stated that a significant amount of drilling has taken place since the estimate which would firm up estimates of probable reserves and further add to the estimate. Proven reserves were estimated to be 41 per cent of the 16 billion cubic metre total estimate.

Views of the Interveners

Several producers intervened in the proceedings and strongly supported the NOVA application. The interveners generally expressed the view that the reserves in the subject area were significant. None of the interveners presented evidence regarding NOVA's reserve estimates, although Canadian Superior Oil Ltd. presented an estimate of its reserves in the Liege area.

Pan-Alberta supported the application and pointed out that the pipeline was necessary to fulfill contracts related to exports associated with the pre-build portion of the Alaska Highway Gas Pipeline Project.

Views of the Board

The Board has reviewed the reserve and deliverability information presented and is satisfied that there is a need for the pipeline. NOVA's estimate of 6.6 billion cubic metres of proven reserves compares fairly closely with proven reserves as estimated by the Board. In considering the location of the fields and the stage of development for the area, the Board is satisfied that continued development will increase the proven reserves substantially. The Board also notes that the reservoir characteristics should allow for high initial deliverabilities which should more fully utilize pipeline capacity during the initial years of operation.

4 TECHNICAL CONSIDERATIONS

The Board has reviewed the application with regard to technical design considerations and finds the design to be appropriate and acceptable.

On the issue of pipeline size and capacity, the Board has reviewed the one-up and one-down alternatives and, in view of the reserves and deliverability evidence presented, agrees that the proposed size is appropriate. The Board notes the concern raised by the Department of the Environment through questioning, that the crossing of the Athabasca River should involve the largest size pipe likely to be needed in order to avoid a second crossing. The Board, having regard for the proven reserves and potential of the area, and for the extra costs related to a larger pipeline size, will not require a change in the proposed size.

5 SUITABILILITY OF THE ROUTE

The Board has reviewed the alternative routes considered by NOVA and is in agreement with the applicant's proposed route. The Board notes that alternative routes to the Marten Hills or Calling Lake areas are longer and costlier and may have greater environmental impact.

NOVA presented detailed geotechnical background in relation to the Athabasca River crossing. NOVA's evidence was that the crossing selected was at a location of minimum approach slopes where no grading would be necessary, to minimize any future instability problems which may result from grading on the slopes. NOVA had fully investigated bedrock depths and planned to install drainage facilities to control surface water.

The Board is satisfied that the applicant has addressed geotechnical matters sufficiently. Based on the evidence presented, the Board considers that the proposed Athabasca River crossing site is the most appropriate.

6 CONCLUSIONS AND DECISION

The Board has considered the evidence on the issues as described and is satisfied that approval of the application would be in the public interest. Accordingly, the Board, subject to receipt of the appropriate Ministerial Approval, will grant a permit for the construction of the Liege lateral, Application 810600.

DATED at Calgary, Alberta on 10 December 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy
Vice Chairman

VE Bohme

V. E. Bohme
Board Member

F Trofanenko

F. Trofanenko
Acting Board Member

TABLE 1 THOSE WHO APPEARED AT THE HEARING

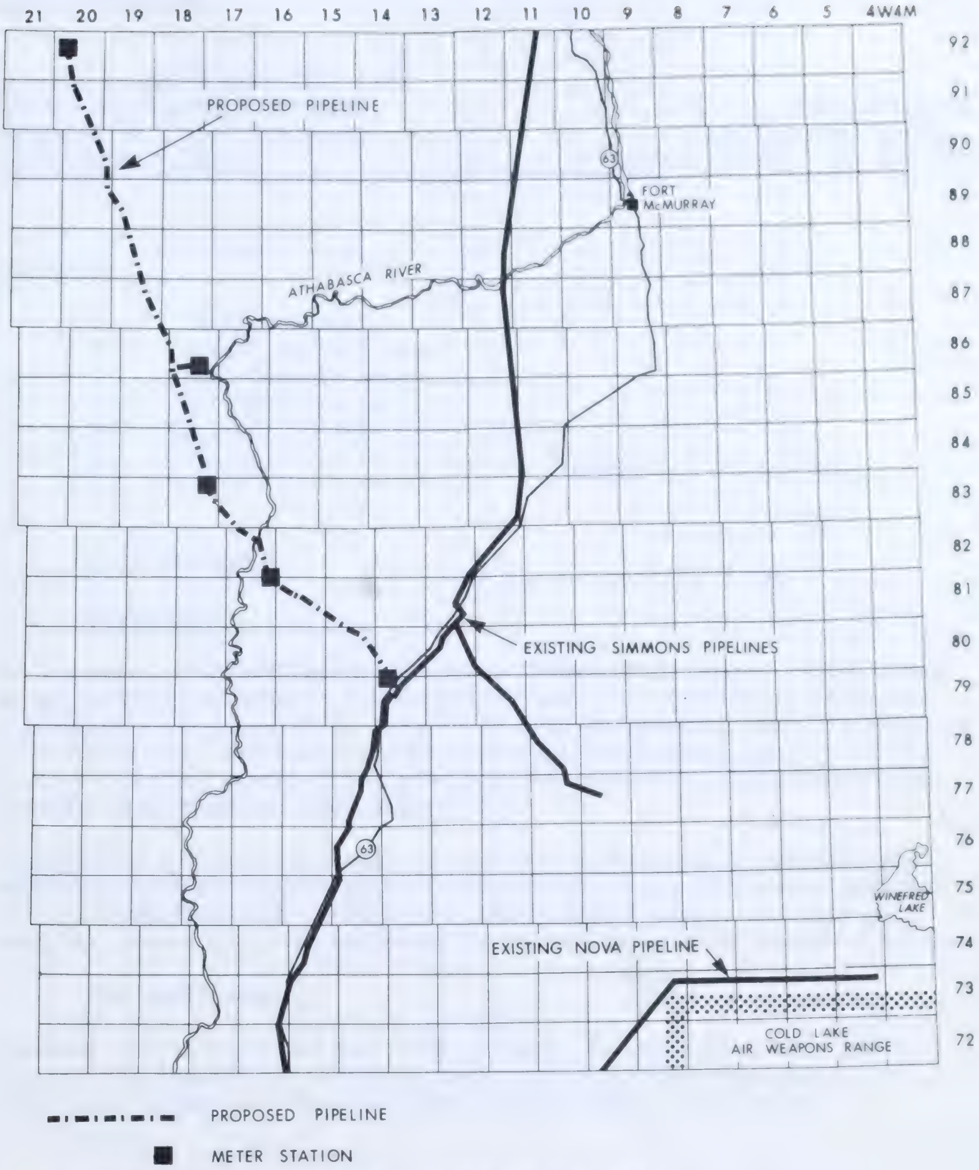
Principals and Representatives (Abbreviations used in Report)	Witnesses
NOVA, An Alberta Corporation (NOVA) H. D. Williamson	V. B. Kromand, P.Eng. F. Barlage, P.Eng. C. P. Mason R. G. Marshall, P.Eng. R. W. Smidt Dr. J. B. Lee, P.Eng. L. Mattar, P.Eng.
Canadian Occidental Petroleum Ltd. (Can. Occidental) D. W. Parsons	
Pan-Alberta Gas Ltd. (Pan-Alberta) K. F. Keeler	L. H. Larson, P.Geol. D. G. Snyder, P.Eng.
Paramount Resources Ltd. G. Peaker, P.Eng.	C. H. Riddell, P.Eng.
Petrobolt Resources Ltd. Norseman Mines Ltd. Touche, Thomson & Yeomen Exploration C. H. Riddell, P.Eng.	
I C G Resources Ltd. (I C G) P. Krenkle, P.Eng.	
Canadian Superior Oil Ltd. (Can. Sup.) R. J. Lane	R. W. Stanich, P.Eng.
Coseka Resources Limited (Coseka) T. Shewan	
Independent Petroleum Association of Canada (IPAC) A. E. Potter, P.Eng.	A. E. Potter, P.Eng.

TABLE 1 THOSE WHO APPEARED AT THE HEARINGS continued

Principals and Representatives (Abbreviations used in Report)	Witnesses
Simmons Pipelines Ltd J. B. Ballem, Q.C.	R. A. Ursel, P.Eng.
The Energy Resources Conservation Board staff (Board staff) D. Holgate G. Dunn, P.Eng. M. Vandenbeld A. Nixon	
For the Department of the Environment T. Bossenberry R. Dyer	

Those who submitted a written submission but did not appear at the hearing:

North Canadian Oils Ltd.
Teck Corporation
Aldona Mines



NOVA, AN ALBERTA CORPORATION.
APPLICATION NO. 810600.
LIEGE AREA.

FIGURE 1

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

ALBERTA PRODUCTS PIPE LINE LTD. PERMIT TO CONSTRUCT DEFERRED PORTIONS OF A PIPELINE FROM EDMONTON TO CALGARY

Decision 81-34
Applications 810460, 810461, 810462, and 810513

CONTENTS

1 Introduction.............. 1
2 Gravel Deposit Area........ 2
3 Coal Deposit Area.......... 4
4 Watelet Lake Area.......... 5
5 Project 80 Area............ 6
6 Decision.................. 13

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1 INTRODUCTION

1.1 Background

In September 1980 the Energy Resources Conservation Board (Board) heard an application by Alberta Products Pipe Line Ltd. (APPLE) to construct a pipeline from Edmonton to Calgary to loop an existing products pipeline. In its decision[1] the Board granted approval for a major portion of the line, but denied approval for some parts of the route where contentious issues had been raised (see Figure 1).

The applicant was advised that the Board was prepared to consider new applications which investigated in detail all reasonable route alternatives or modifications through the controversial areas, and that a separate permit (or permits) would be issued for a final approved route.

1.2 The Applications

Pursuant to The Pipeline Act, 1975, Alberta Products Pipe Line Ltd. applied for permits to construct the previously deferred segments of 273.1 millimetre O.D. pipeline loop in the following locations:

---

[1] Energy Resources Conservation Board, 1980
Alberta Products Pipe Line Ltd.
Permit to Construct a Pipeline
from Edmonton to Calgary.
ERCB Decision Report 80-30
Calgary, Alberta

(a) Application 810461: From the north boundary of township 41, range 27, west of the 4th meridian to the south boundary of township 40, range 27, west of the 4th meridian (gravel deposit area);

(b) Application 810460: From the north boundary of township 46, range 26, west of the 4th meridian to the south boundary of township 44, range 26, west of the 4th meridian (coal deposit area);

(c) Application 810462: From the north boundary of township 48, range 25, west of the 4th meridian to the south boundary of township 47, range 26, west of the 4th meridian (Watelet Lake area); and

(d) Application 810513: From legal subdivision 10 of section 4, township 53, range 23, west of the 4th meridian to the south boundary of township 50, range 25, west of the 4th meridian (Project 80 area).

1.3 The Hearing

A public hearing of the application took place on the 21, 22, and 23 October 1981 in Edmonton, with G. J. DeSorcy, P.Eng., N. Strom, P.Eng., and R. G. Evans, P.Eng., sitting. Participants at the hearing and the abbreviations used in this report are listed in Appendix A.

2 GRAVEL DEPOSIT AREA (See Figure 2)

2.1 The Applicant's Views

APPLE stated that its preferred route was in the present APPLE right of way through the gravel area, and that its choice had been made after weighing the pros and cons of alternative routing around the deposits. An alternative route was found to be longer and more costly than the present route, and appeared to offer no major advantage at this time. Discussions had been held with the County regarding the effect the pipeline might have on future gravel recovery, and APPLE stated it was prepared to move the loop line out of the right of way at its own expense if and when gravel operations would be compromised. It would also be prepared to negotiate a cost-sharing arrangement with the County to move the existing line at the same time, if the County would provide the necessary land for a right of way.

In support of its choice for following the existing right of way route, APPLE argued that the timing and extent of gravel removal is largely unknown at this time. Minor route modifications could be made to accommodate local gravel recovery operations, but a complete reroute of the pipeline loop around the gravel deposits would be impractical because of indeterminate gravel operations. In addition, separate rights of way would increase the risk of damage to the pipeline by others and reduce surveillance efficiency. Regarding the proposed landfill site in the northwest quarter of section 29, APPLE stated that it was presently negotiating with Alberta Environment to relocate its existing pipeline around the site, and that the proposed loop would be along the new route.

Summarizing its position, APPLE stated that it would not stand in the way of economic mineral resource recovery, and believed that its preferred route offered the best option to the parties concerned.

2.2 The Interveners' Views

The County's position was one of opposition to the proposed route. It claimed that an additional pipeline would further encumber gravel resources and complicate quarrying efforts. It did not favour an alternative route since this would only address the problem of the loop line and not the existing line, and thus would not provide a solution over the long term. In the absence of a route around the gravel deposits, the County was amenable to having the pipelines relocated in quarried-out areas as gravel-recovery operations progressed on its own lands, and believed that suitable arrangements could be worked out on privately owned lands. The County further contended that the costs associated with this type of relocation should be borne entirely by APPLE, provided that the rights of way were made available to the company. Since the County also purchased gravel from others on a royalty basis in addition to that removed from its own lands, it believed that any arrangements involving the pipelines should apply equally to all owners of the gravel deposits.

The Town of Lacombe stated that although it had minimal interests in the gravel deposit area, (SW¼ section 32), its concerns were basically the same as those of the County. More important, however, was the recent purchase of the NW¼ section 29 for the development of a regional landfill site, and the possible consequences of having pipelines through the area. In order to avoid problems, the Town of Lacombe favoured a modification to the alternative route for the loop line that would bypass the landfill site, and relocation of the existing line for which negotiations with APPLE were being carried out.

2.3 The Board's Views

Given the uncertainty with respect to the details and timing of the quarrying of parts of the gravel deposit, the existence of a line which currently passes through the deposit, and the fact that this existing line is not going to be moved at least at this time, the Board concludes that the appropriate location for the proposed loop is beside the existing line. The Board expects that efficient gravel removal operations could continue, and in future be facilitated by modest modifications to the location of the pipelines. The Board understands that APPLE would be prepared to make such alterations.

Should, at some future time, the relocation of both lines appear necessary due to gravel-quarrying operations, the Board would expect an application for relocation, possibly under section 34 of The Pipeline Act, 1975. If agreement did not exist respecting the financing of the relocating, the Board would hear relevant evidence and make the necessary order fixing such responsibilities. In so doing, the Board would have regard for, among other things, the undertaking given by APPLE at the subject hearing.

Regarding the possible routing of the pipeline around the Town of Lacombe's proposed landfill site, the Board understands that negotiations are taking place between APPLE and Alberta Environment, and believes it would be preferable to deal with that matter should the need arise at a future time.

3 COAL DEPOSIT AREA (See Figure 3)

3.1 The Applicant's Views

In the light of recent negotiations with Crows Nest Resources Limited, and a letter that APPLE had received dated 14 October 1981, the applicant stated that it wished to reverse its position concerning the preferred route. The company no longer supported a route around the coal reserve area, but favoured the route along its existing right of way. APPLE reasoned that if and when it became necessary to relocate its pipelines because of mining operations, which could be many years in the future, mining technology would have developed to the point where route selection would be facilitated. Secondly, under those conditions, APPLE was prepared to accept the risk of whatever cost-sharing might be imposed upon it by a Board ruling under section 34 of The Pipeline Act, 1975. This, of course, would presuppose that the parties were not able to arrive at a negotiated cost-sharing settlement, and that such a Board order was necessary.

3.2 The Board's Views

The Board notes that the principal party associated with the coal reserves in question, namely Crows Nest Resources Limited, was not represented at the proceedings. The Board has therefore discounted the arguments put forward in the Crows Nest Resources' letter of submission other than the comments of APPLE which entered it as an exhibit. From the evidence presented, the Board believes that the applicant's existing pipeline right of way through the coal reserve area provides the most appropriate route for the applied-for line, and agrees with the applicant that the long-term mining activities likely to occur allow sufficient leeway to plan minor route modifications. The Board recognizes that section 34 of The Pipeline Act, 1975, could be invoked if it were found necessary to relocate the pipelines sometime in the future, and a decision as to a proper route and apportioning of costs would be made by the Board on the basis of circumstances at the time of the section 34 application.

4 WATELET LAKE AREA (See Figure 4)

4.1 The Applicant's Views

APPLE stated that its preferred route through the subdivision and around Watelet Lake was along its existing pipeline right of way, and cited a number of reasons for its choice. It believed that the pipelines would not present a hazard to the safety of subdivision residents because of pipeline design considerations. It also understood that the subdivision was at its maximum intended development and therefore the population density around the lines would not increase. APPLE stated that the existing line and new line would be buried well below the minimum required depth in the vicinity of Bevan Drive to facilitate future road improvements and avoid external pipe damage. It also contended that an alternative routing to follow the existing Dome line would be subject to potential flooding in the vicinity of Watelet Lake and associated dams. Finally, APPLE pointed out that the alternative route parallel to the existing Dome line would be one kilometre longer and $146 000 more costly than its preferred route.

4.2 The Board's Views

The Board notes that although letters of intervention were submitted by Mr. R. Lieske and Mr. E. Burghardt, neither person appeared at the proceedings nor were they represented.

On the matter of the applicant's proposed route, the Board agrees with the evidence presented and concludes that a new pipeline parallel to the applicant's existing line represents the route best suited for crossing the area. As mentioned previously in this report, should the possibility of a relocation of the lines require consideration in the future, the matter could be addressed in an application under section 34 of The Pipeline Act, 1975.

5 PROJECT 80 AREA (See Figure 5)

5.1 The Applicant's Views

APPLE stated that in order to consider all logical alternative routes, it had contacted a number of parties directly or indirectly affected. APPLE specifically said it had solicited recommendations from other utilities, checked numerous planning studies, and consulted with other pipeline companies. In addition, it had set out certain route-selection criteria in order to weigh the merits of each alternative. The criteria considered were:

- minimum overall costs
- long-term integrity of location
- minimum impact on existing land use
- possible locations adjacent to existing or proposed linear alignments
- timing for land acquisition
- minimum environmental impact
- benefits to affected parties.

Six possible routes were selected (Figure 5) and compared by the applicant using the above criteria (Table 4.1 - Appendix B). Under questioning, APPLE explained the reasoning behind the various rankings given to the alternative routes in Table 4.1, and why it had chosen Routes 1 and 5 as its first and second choice respectively. APPLE made it clear that it was not applying for any of Routes 2, 3, 4, or 6, but had included evidence on these routes to show that they were not acceptable. The applicant pointed out that Table 4.1 was only a means for comparing the various route alternatives, and that no particular weighting was given to the various factors making up the table. APPLE agreed that weighting the factors in different ways could significantly change the answers that the table would provide. Based upon Table 4.1 and the route criteria chosen, the applicant outlined the advantages and disadvantages of each possible alternative route as follows, and showed why Route 1 was its preferred route, and Route 5 was its alternative choice.

Route 1 - The major advantages of the preferred route are least length and cost, least negative impact on existing land use, use of an existing linear alignment, minimal new right of way to acquire, and least environmental impact. The main disadvantages appear to be some risk of damage by others during the development of Project 80, and possible economic benefits to Project 80 resulting from the removal of all pipelines.

Route 2 - This route would basically follow the Highway 2 alignment and APPLE believes the main advantage to be the fact that the pipeline would be in a "corridor" with other utility and transportation alignments. Numerous disadvantages were cited, chiefly those of highest cost, conflict with industrial parks and buildings, difficulty of land acquisition, and the perceived higher impact on Project 80.

Route 3 - The advantages of this route as identified by the applicant are primarily the remoteness from Edmonton's urban expansion, low land acquisition costs, less use of prime agricultural land, and best potential for future corridor alignment. The main disadvantages from the standpoint of the applicant are the lack of economic benefit to Project 80 if the developer was involved in rerouting costs related to the existing line, the environmental aspects of the Irving Creek crossings, and the possible constraint to the northern expansion of the Hamlet of Beaumont.

Route 4 - The applicant saw a number of advantages to this route, namely good corridor potential, no apparent confliction with probable land-use development, and a good compromise on costs. These were balanced out by the fact that a new right of way would be established (existing or proposed linear developments could not be followed) and that some 44 new land parcels would have to be acquired.

Route 5 - This was APPLE's only alternative route that was officially included in its permit application. APPLE stated that there were significant advantages and reasons for its choice, primarily its lowest cost next to the preferred route. Also it closely followed the development boundaries of Project 80, minimized additional new right of way, and offered the best ultimate solution to the Project 80 development. In the applicant's judgement, the disadvantages were minimal, being chiefly the opposition by the City of Edmonton and the lesser potential for corridor development.

Route 6 - This was one of the least attractive alternatives from the applicant's standpoint, having little or no advantage over the others, and embodying a number of the disadvantages. There were no economic incentives associated with this route, but land-use impacts were the equivalent of any of the other routes investigated.

Speaking to the matter of a "penetrator corridor", the applicant expressed its support for such a corridor in order to allow ingress and egress from or to the south and the refining area of Edmonton. In APPLE's judgement, a penetrator corridor extending south from the Edmonton or Sherwood Park West Restricted Development Areas would guarantee space for future pipelines and minimize land alienation, but could create problems, economic and otherwise for itself because of the extra length associated with an east-west connection, and the extended time that could be involved in new land acquisition. The applicant pointed out that this was one of the main disadvantages of Route 3.

The applicant also described the terms and conditions it was prepared to meet in a matter it referred to as an "undertaking". Should the company be allowed to construct the loop line in the same right of way as the existing APPLE and Rimbey pipelines (Route 1), and should there be a time when the company was directed to relocate all three lines into a penetrator corridor, APPLE would pay the incremental (additional) costs associated with the relocation of the loop line. Pressed for a clarification of the incremental costs involved in the undertaking, APPLE explained that it meant the company would be responsible for the costs of moving the loop line, exclusive of the new right of way involved. The payment of all other costs associated with relocating the remaining two lines would be assessed to parties other than APPLE.

APPLE summed up its position by stating that it believed it had investigated in detail all reasonable route alternatives in the area, and had fully taken into account the advantages and disadvantages of each. From this investigation, the applicant could only conclude that its preferred route along the existing APPLE and Rimbey pipeline rights of way remained the best choice.

5.2 The Interveners' Views

A number of interveners challenged the applicant's choice of preferred route, and countered with arguments to show that some of the alternatives were, in their views, superior. Mr. Ingram, on behalf of a group of landowners along the proposed Route 5 vigorously opposed that route. He stated that his clients favoured the corridor concept and opposed the proliferation of individual utility routes which increased impacts, costs, and damage. Mr. Ingram stated that the proposal for construction of a loop line into the Edmonton area might be premature, inasmuch as the location of a penetrator corridor had not been established. He said that in the absence of such a corridor, the best location would be along Route 2 (parallel to Highway 2), or Route 3 (at the eastern and southern extremity of lands to be annexed to the City of Edmonton). In support of these claims, Mr. Makale, a professional town planner and consultant, cited a number of reasons for supporting the corridor concept, and specifically endorsed the idea of pipelines following existing rights of way or penetrator corridors. Mr. Makale argued that proposed pipeline routes in the Project 80 area should be judged not only on the basis of specific development proposals, but also in terms of overall urban development over the next 20 years. He pointed out that the Project 80 plan had not yet been adopted, and also that urbanization may be many years in the future. Commenting on the applicant's preferred and alternative route choices (Routes 1 and 5), Mr. Makale claimed that both routes would be in future urban land, and neither were satisfactory on a permanent basis. On an interim basis, however, he asserted that the least disruption would be caused if the loop line followed the existing alignment rather than creation of a new alignment (Route 5). Taking the long-term approach, Mr. Makale contended that since all land in the area within the January, 1982 City of Edmonton boundary designations (see Figure 5), should be considered potentially developable, it would be best to ultimately, and permanently, relocate the three pipelines (the two existing lines and the loop line) to a location outside of these boundaries. A penetrator corridor would likely be established in the near future, and if it extended south of the Sherwood Park West Restricted Development Area, then Route 3 could likely be considered as a viable location.

Daon stated that it was unalterably opposed to the applicant's preferred route (Route 1) through the proposed Project 80 development for the reasons outlined in its earlier submission. Daon said these reasons had remained valid over the intervening time. They basically concerned the danger that Daon perceived would be added to a developing urban area by an additional pipeline, and the creation of a pipeline corridor that would receive official sanction. Commenting on the other alternatives available for the loop line location, Daon supported Route 3 as its first choice primarily because of its remoteness from developable land in the Edmonton region. While Route 5 would solve Daon's immediate problem, it would just transfer that problem to another nearby area that would likely be developed in a similar fashion by others. Therefore, in Daon's opinion, Route 5 was a poor alternative.

Asked about its position concerning a choice between the applicant's preferred route (Route 1) and Route 5, Daon said that for a temporary solution it would choose the former, with the proviso that a substantial undertaking be made by the applicant to relocate the loop line into a future penetrator corridor, and to enter into a negotiated sharing of costs for relocating the two existing lines.

The City of Edmonton stated opposition to the applicant's preferred route, primarily because of long-term land use planning considerations. It favoured the route along Highway 2 (Route 2) since that would promote a consolidation of facilities into a corridor configuration that already contains five pipelines in a "de facto" corridor. The City found Route 3 to be an acceptable alternative, primarily because it avoided potential urban development areas, and could possibly be part of a penetrator corridor. The City believed that Route 5 would fragment land, create new rights of way, and not contribute to corridor alignments. For these reasons, it would not support Route 5.

Mr. A. Schotte appeared as an intervener concerned with the applicant's proposed route on his property in Hulbert Crescent within the Sherwood Park West Restricted Development Area. Mr. Schotte explained the problems of living on two or three acres of property and then being subject to multiple pipeline rights of way on that property. Although he had initially purchased the land believing that it would allow him to live in a rural setting, instead he now found himself in what was essentially a transportation corridor. Mr. Schotte also made certain statements respecting negotiations with Alberta Environment.

5.3 The Board's Views

The Board believes that two of the more significant factors that must be considered in dealing with the subject applications are the need for, and timing of a new penetrator corridor in the South Edmonton area, and the existence of two pipelines on the applicant's preferred route.

The Board acknowledges the need and general acceptance of corridors for pipelines, and it endorses the corridor concept. A penetrator corridor, however, is not yet in place south of Edmonton, and this has an important bearing on any analysis of the proposed and alternative routes. Obviously, the location of a penetrator corridor is critical to the area, and should be taken into account for the long term. To give a better understanding of the Restricted Development Area locations around the south part of Edmonton, and the general region that might be considered for a penetrator corridor, see Figure 6.

In analysing the pros and cons of the various routes, the Board is of the opinion that Routes 4 and 6 have the disadvantages of interfering with potential development and impacting on the environment, but offer no particular advantages over the other routes. The Board thus dismisses these alternatives. For the remaining routes, the Board believes they should be examined taking into account the following factors:

- corridor potential
- impact on existing land use
- long-term location integrity (this refers to the likelihood that the pipeline would have to be moved in the future)
- pipeline safety
- environmental impacts
- impact on relocation of existing pipelines
- cost.

Route 1 - The Board believes that this route offers significant advantages over the short term, since the proposed pipeline could be placed in an existing right of way with other pipelines. Additionally, it is the shortest and least costly of the alternatives discussed at the hearing. Its main drawback would appear to be the potential interference with Daon's future development plans.

Route 2 - The Board recognizes that this route along Highway 2 is already a small "de facto" corridor, and that it could provide a logical route for a new pipeline to follow. However, from the evidence presented, there appears to be very little room for new pipeline rights of way, and the long-term prospects for additional pipelines seem to be impractical. The Board believes that land acquisition in this area could be extremely difficult as these lands are viewed as future commercial development property.

Also, the long-term integrity of pipelines in this area could be difficult to maintain, given the intense construction activities that appear imminent. Under these circumstances, the Board does not believe this route to be a very suitable alternative.

Route 3 - This route has a number of significant advantages over the others, namely its potential for future corridor development, and its remoteness from planned urban development over the next 20-40 years. However, it is longer than the other routes, would create a second pipeline alignment in the area, and would involve significant costs in any rerouting of the APPLE and Rimbey pipelines. The Board believes this route has some definite attractions but the uncertainty at this time of the location and timing of a penetrator corridor detracts from its overall suitability.

Route 5 - The Board believes that this route, the alternative suggested by the applicant, has a number of advantages in that it avoids the Project 80 development, has little effect on the environment, and does not require very much new right of way. However, balanced against this is the fact that it appears to have little corridor potential over the long term, and is in an area of future urban development in a timeframe probably very close to that of the Project 80 area. The Board also agrees with the argument of Daon that putting a pipeline on the route would be only transferring a problem from one urban area to another nearby urban area. Taking all these factors into account, the Board concludes that this is not a suitable route.

In summary, the Board concludes that the only two routes discussed at the hearing which might be suitable for the proposed pipeline are Routes 1 and 3. It should be noted that Route 1 was the applicant's preferred route, but since Route 3 was not officially proposed as an alternative and as a result was not advertised, the decision before the Board is to either approve Route 1 or deny the application.

Route 1 has the advantage of not creating an additional linear disturbance through the region pending the establishment of an official corridor. On the other hand, it would impact on Daon's Project 80 and represent another pipeline through an urban area. It is the Board's view, however, that the third line in the same alignment through Project 80 would have little incremental impact on urban development in the area. This is because the restrictions for three lines and the resulting limitations placed on urban development would not be significantly different than for two lines. Notwithstanding this, the Board recognizes that placement of the third line in the existing route may discourage relocation of the two existing lines, and to this extent would impact negatively on Project 80.

The Board finds the following factors to be most relevant to a decision on the current application:

(1) The need for the pipeline was established at the earlier hearing and was analyzed and spoken to in the Decision 80-30. Having regard for previous conclusions respecting products market growth, deferral of the installation of the proposed pipeline for a period of two or three years would not have a serious negative impact on the public interest. However,

while the construction, now in an advanced stage, of the Turbo refinery near Calgary will likely reduce the urgency of the need for the APPLE line to deliver additional refined products to southern Alberta, it has not changed the need for the pipeline in terms of the applicant's timing of, and economic viability for, its proposed pipeline loop.

(2) The Project 80 area is still in the early planning stages and initial development is not anticipated until 1983 or later.

(3) Placement of a third pipeline between two existing pipelines in the Rimbey/APPLE right of way through the Project 80 area introduces relatively little additional impact to that which already may exist.

(4) The need for and proper location of a penetrator corridor in southeast Edmonton is uncertain at this time.

(5) Given that the pipeline owners and Daon may each be obliged to bear a portion of the costs of relocating the pipelines into a penetrator corridor at some future date, each may see economic advantages in pressing for relocation at this time.

The Board is satisfied that installation of the proposed pipeline in accordance with the schedule proposed by the applicant would meet the test of orderly and economic development under The Pipeline Act, 1975. The question of optimum routing through or around the Project 80 area or other nearby projected urban growth areas introduces a further complexity as to whether approval of the applied-for route would be in the public interest. The Board considers the timing and nature of urban development as being tentative, and the establishing of a penetrator corridor as quite uncertain at this juncture. Also, the Board considers that the proposed route, Route 1, which would follow the existing pipeline alignment, is more suitable than creating another pipeline route which may or may not fit into a future penetrator corridor. The Board therefore concludes that approval of Route 1 is in the public interest and that it would be inconsistent with economic and orderly development to defer approval.

The Board recognizes that the question of possible relocation of the applied-for pipeline and the two existing pipelines to a penetrator corridor, when and if one is declared, would not be resolved by this decision. The Board is aware that it may have to deal with the matter again in the future, possibly through an application under section 34 of The Pipeline Act, 1975. If such does occur, the Board would deal with the question of pipeline relocation on the basis of evidence brought before it at that time. Also, if requested to make an order respecting the costs of relocating pipelines, the Board would base its decision on the circumstances then existing and the evidence brought before it.

The Board recognizes that APPLE made a form of commitment at the subject hearing regarding the possible relocating of the applied-for pipeline. However, the Board wishes to emphasize that it would not necessarily have regard for that undertaking in making an order respecting costs at some future time.

The Board recognizes that its decision to grant the applied-for permit to APPLE but to remain silent on the question of possible future relocation of the pipelines, represents a risk to all parties. If APPLE proceeds and installs a third line in the existing alignment, it runs a risk of having to move the line, along with the other lines, and possibly paying part or all of the relocation costs. Similarly, the addition of a third line increases the risk that Project 80 and its sponsors might have to pay relocation costs, in whole or in part, if they wish the pipeline outside of the Project 80 boundary. The Board sees this as unfortunate and hopes that the involved parties would take an immediate further look at the question of possible relocation of the pipelines on a negotiated basis. The Board received evidence at the hearing that Alberta Environment has engaged a consultant to investigate a penetrator corridor. The Board believes the parties affected by this decision, for example APPLE and Daon, should discuss the possibility and timing of a penetrator corridor with Alberta Environment as part of this final effort to resolve the long-term pipeline location matter at this time. Since the Board believes that a further effort should be made in this direction, it will condition the permit it issues to APPLE requiring it to report to the Board that it has investigated this matter with other involved parties, and the results of its investigation, prior to the commencement of construction of the applied-for pipeline.

The Board is sympathetic to Mr. Schotte's concerns regarding the proximity of pipelines to his property in the Sherwood Park West Restricted Development Area, but notes that his property is crossed by what has been established as a utility corridor. The Board requests that APPLE consider Mr. Schotte's position, and attempt to work out a mutually satisfactory arrangement with him. The Board has also passed on Mr. Schotte's concerns to Alberta Environment.

6 DECISION

The Board grants the applications by Alberta Products Pipe Line Ltd. to construct pipelines along its preferred routes in the following locations:

(a) from the north boundary of township 41-27 W4M to the south boundary of township 40-27 W4M (Gravel Deposits area):

(b) from the north boundary of township 46-26 W4M to the south boundary of township 44-26 W4M (Coal Deposits area);

(c) from the north boundary of township 48-25 W4M to the south boundary of township 47-26 W4M (Watelet Lake area); and

(d) from legal subdivision 10-4-53-23 W4M to the south boundary of township 50-25 W4M (Project 80 area).

The Board will request the approval of the Minister of Environment and his consent respecting the use of a Restricted Development Area. If received, the appropriate permit to construct the approved portions of line will be issued to Alberta Products Pipe Line Ltd. With respect to a pipeline through the Project 80 area, the permit would be conditioned to require APPLE to discuss, once more, the possible relocation of lines with involved parties, and to satisfy the Board that every reasonable effort has been made to determine whether a relocation of the lines in question can be agreed to at this time. APPLE would be required to report thereon to the Board, and the permit would provide that no construction take place until the Board was satisfied in this respect and had so advised APPLE in writing.

ISSUED at Calgary, Alberta, on 16 December 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy, P.Eng.
Vice Chairman

N Strom

N. Strom, P.Eng.
Board Member

R G Evans

R. G. Evans, P.Eng.
Acting Board Member

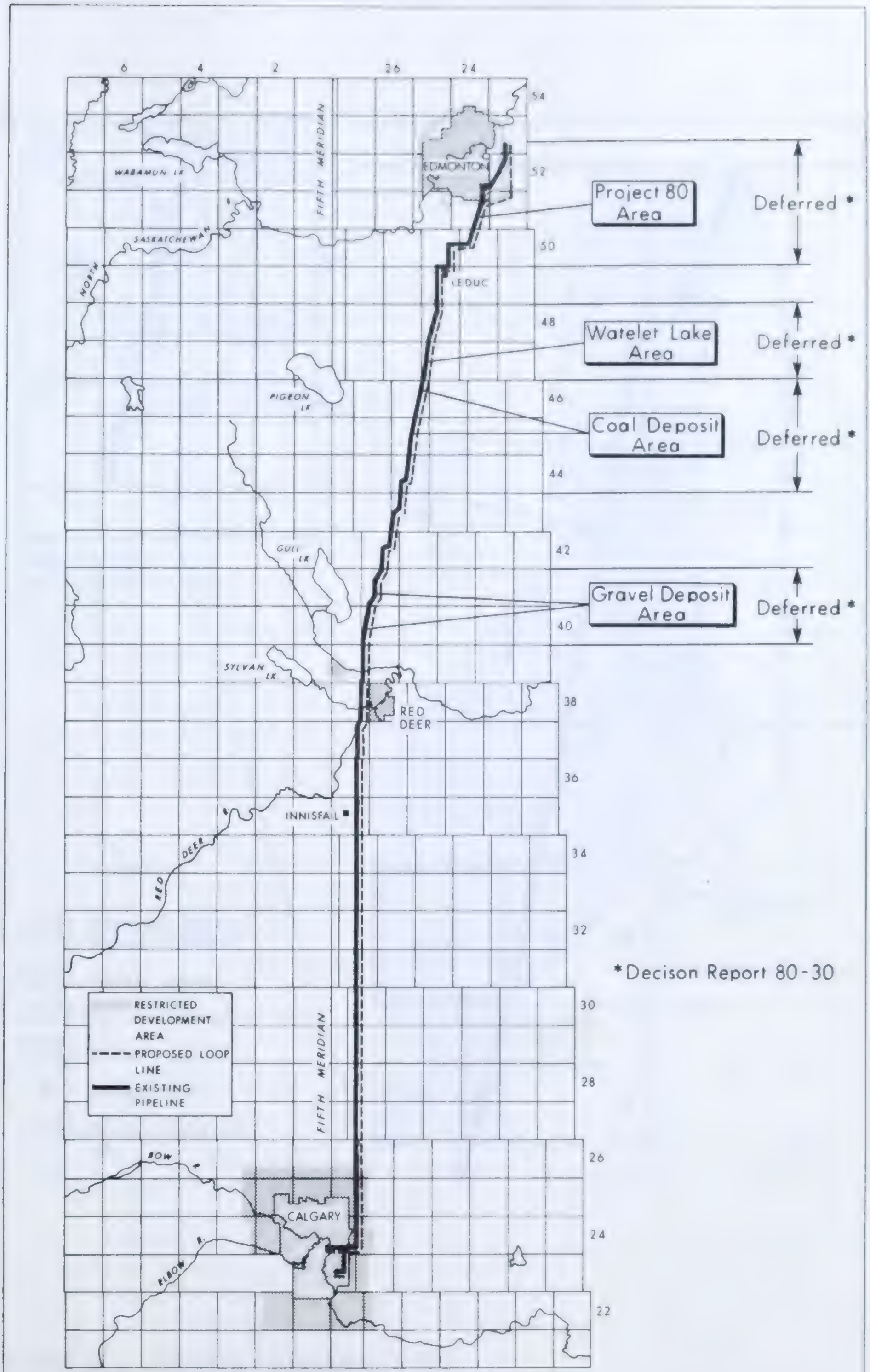

FIGURE 1 DEFERRED PORTIONS OF PIPELINE LOOP RE-APPLIED FOR BY ALBERTA PRODUCTS PIPE LINE LTD. (APPLE)

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

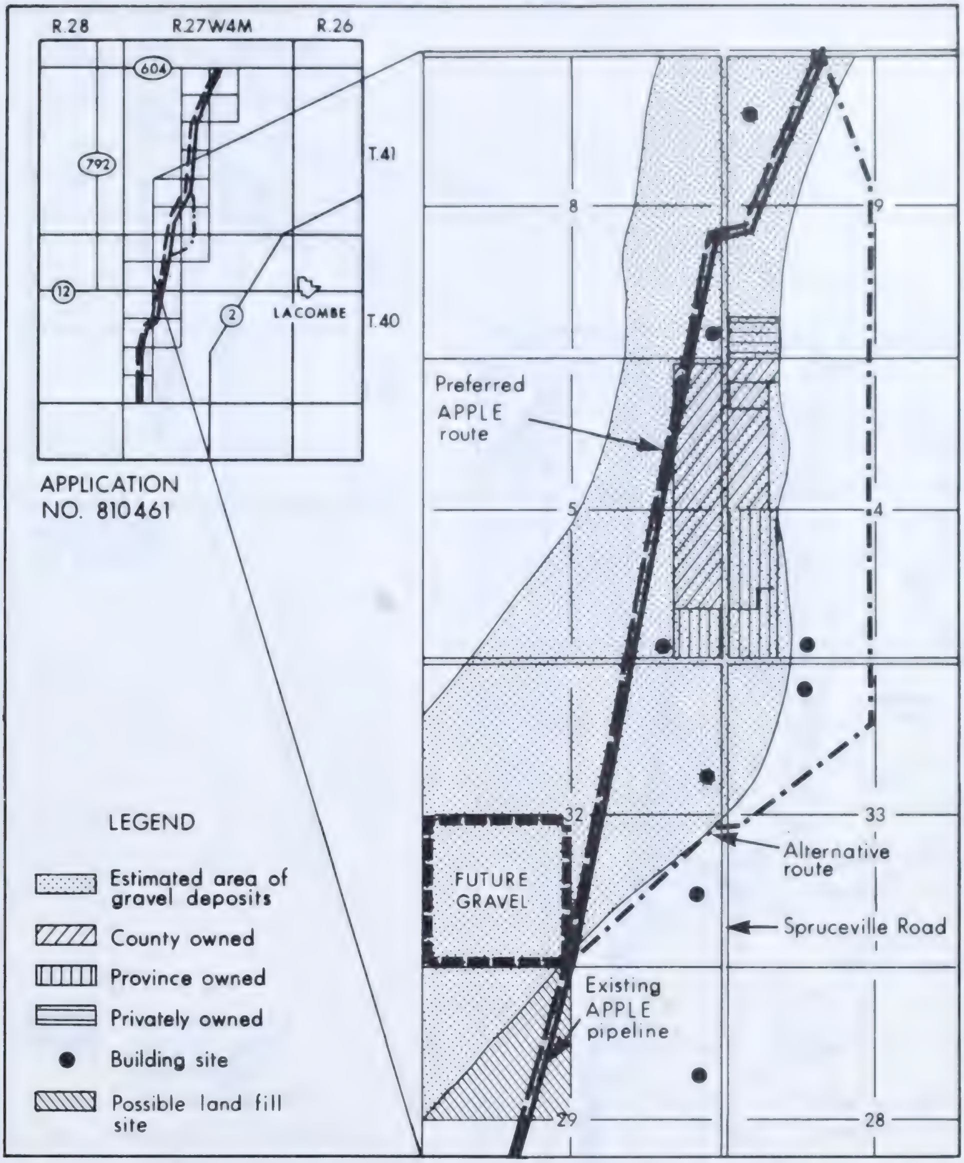

FIGURE 2 GRAVEL DEPOSIT AREA

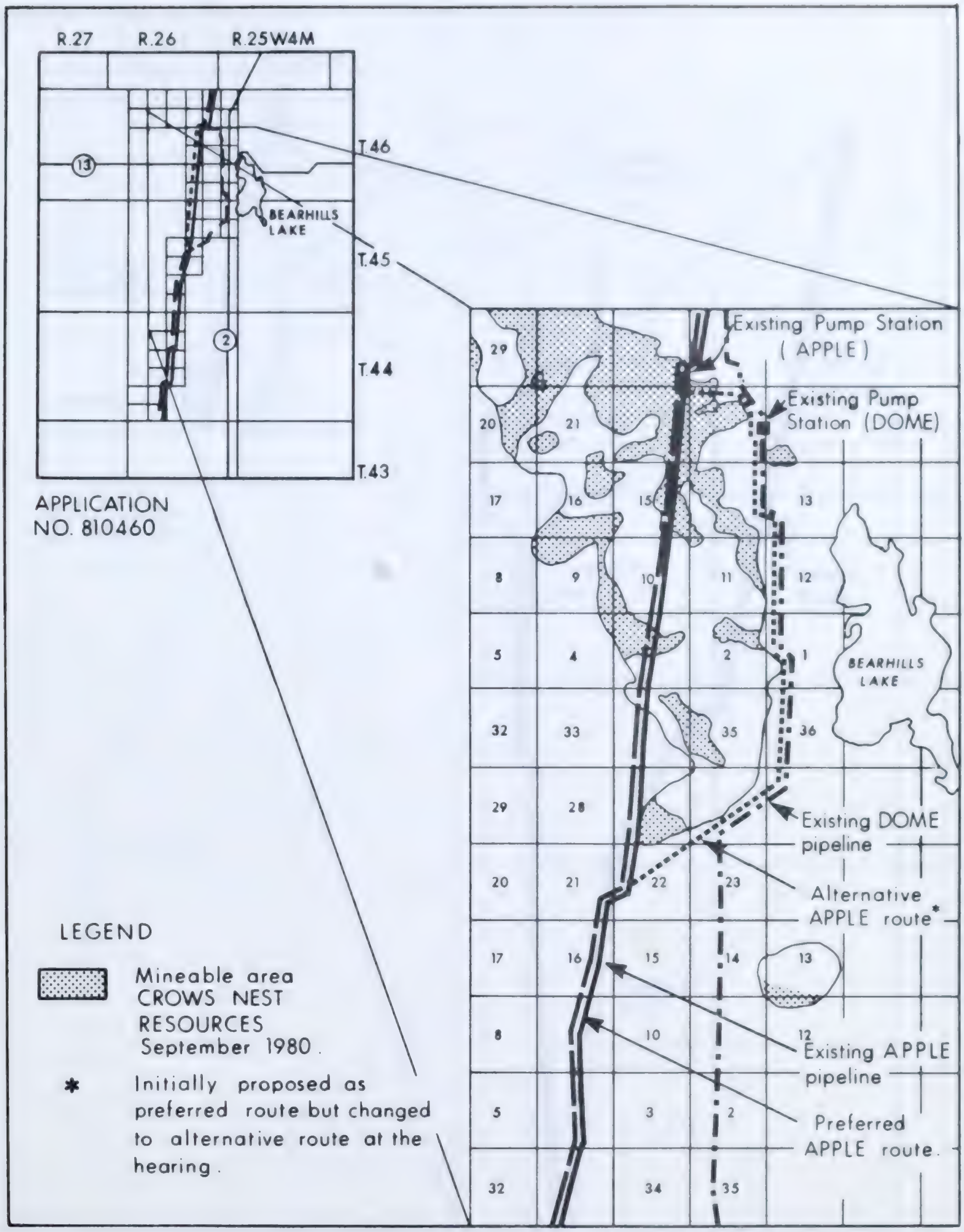

FIGURE 3 COAL DEPOSIT AREA

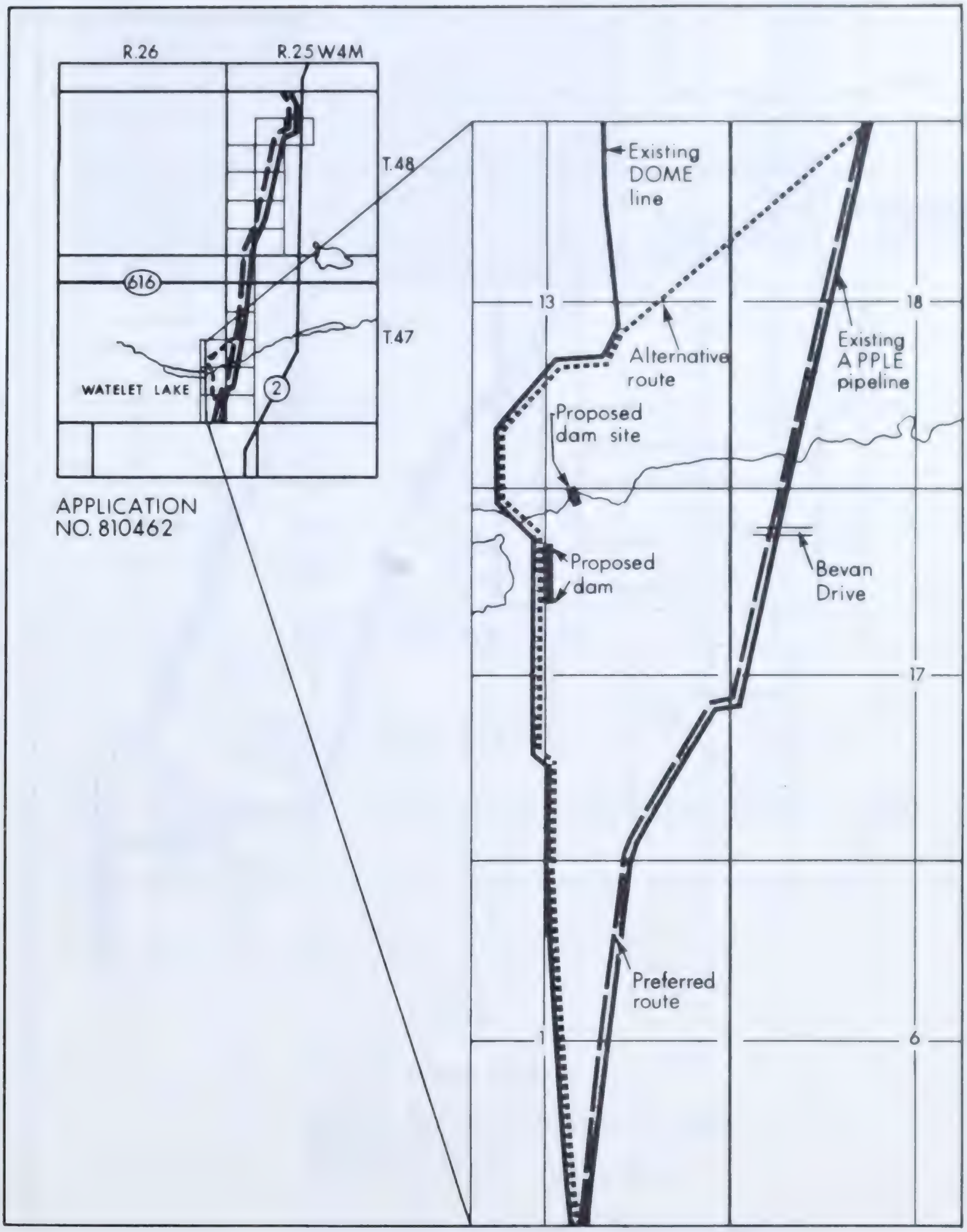

FIGURE 4 WATELET LAKE AREA

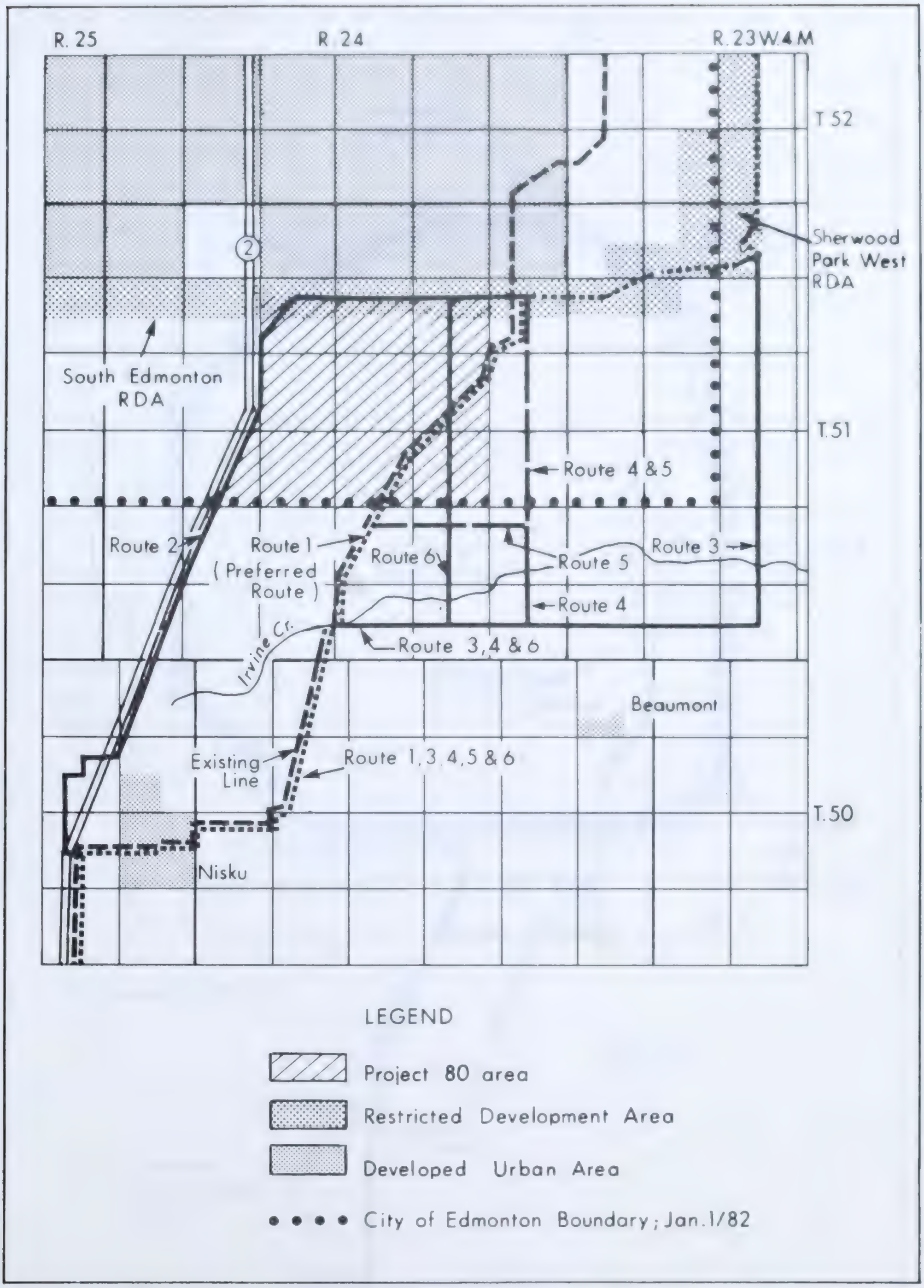

FIGURE 5 PROJECT 80 AREA

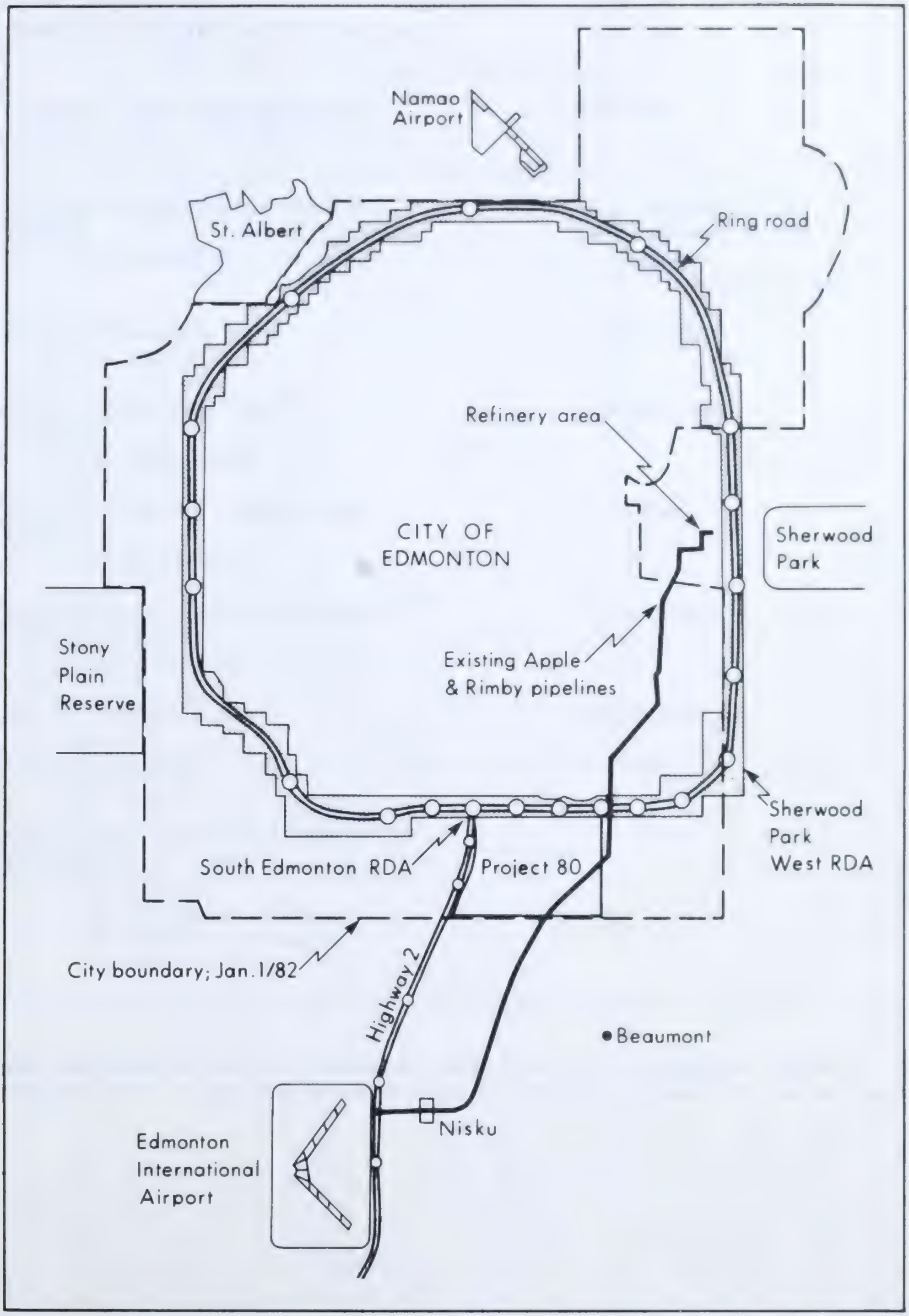

FIGURE 6 EDMONTON AREA. From submission of Daon Development Corp.

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

APPENDIX A

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Alberta Products Pipe Line Ltd. (APPLE) J. Anderson	H. E. Feasby, P.Eng. R. E. Gunson, P.Eng. J. Lawrence G. R. Ursenbach, P.Eng.
City of Edmonton M. McAvoy	W. Cameron
County of Lacombe No. 14 (County) E. Koberstein	E. Koberstein
Daon Development Corporation (Daon) T. W. Gallant	N. Winter
Landowners - Alternative Route (the Landowners) D. G. Ingram	D. L. Makale
Mr. A. Schotte	A. Schotte
Town of Lacombe F. Lacey	F. Lacey
Energy Resources Conservation Board staff K. Miller R. J. Allman, P.Eng. A. Cassley, P.Eng.	

Two interveners, Mr. E. Burghardt, and Crows Nest Resources Limited, respectively, submitted interventions but did not appear at the hearing.

TABLE 4.1
ALTERNATIVE ROUTE COMPARISONS AND RANKING[1]

	1		2		3		4		5		6	
	EXISTING		HWY. #2		RDA EXT. & TOWNSHIP		PROJ. 80 & TOWNSHIP		PROJ. 80 BOUNDARIES		INSIDE PROJ. 80	
Route Nodes	ABC .... J		AKSGHJ		ABDNJ		ABDMGJ		ABELGJ		ABDTSJ	
Length (A-J) (km)	22.8	1	23.8	2	26.4	5	25.4	4	24.9	3	25.4	4
Total Cost ($ Millions)	3.057		5.884		4:096		4.616		3.994		4.640	
Incremental Cost	0	1	2.820	6	1.040	3	1.560	4	0.938	2	1.584	5
Long term integrity	Existing Pipelines	2	Existing Hwy/RR/PL	1	No Status Proposed Trans Alta	3	No Status	4	No Status	5	No Status	6
Impact on existing land use												
Number of buildings	0	1	8	5	1	2	2	3	1	2	3	4
Number of new parcels	8	1	66	6	40	4	44	5	24	3	22	2
Existing Linear Alignments	Yes	2	Yes	1	Proposed	3	No	4	No	4	No	4
Virgin ROW length (km)	0	1	0	1	17.1	5	10.4	4	7.5	2	9.3	3
Timely land acquisition		1		6		3		4		2		5
Environmental Impact												
Creek/drainage crossings	2	2	1	1	4	4	5	5	2	3	5	6
Ranking Totals Unweighted		12		29		32		37		26		39
APPLE Preferences		1		5		4		3		2		6

Note: [1] As submitted by the applicant.

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

HUDSON'S BAY OIL AND GAS COMPANY LIMITED
GAS PROCESSING PLANT — Decision 81-36
BRAZEAU RIVER FIELD — Application 810418

GOVT DOCS
JAN 1 [illegible] 1982

1 APPLICATION AND HEARING

Hudson's Bay Oil and Gas Company Limited (HBOG) applied, pursuant to section 38 of The Oil and Gas Conservation Act, for approval of a scheme for the processing of sour gas in a plant to be located in the northwest quarter of section 10, township 47, range 14, west of the 5th meridian. The application was the first part of a two-part application for approval to construct the plant. The second part of the application, for approval to operate, is to be submitted for consideration at a later date.

The proposed plant would be designed to process a maximum of 1.69 million cubic metres per day of sour raw gas from which 468 thousand cubic metres of sales gas, 1385 cubic metres of condensates and LPG mix, and 300 tonnes of sulphur would be recovered. A maximum of 12.0 tonnes per day of sulphur dioxide would be emitted to the atmosphere through an incinerator stack 43 metres in height. The majority of the liquids would be recycled to underground formations on a voidage replacement basis.

The application was considered by the Board at a public hearing conducted in Drayton Valley, Alberta on 15 December 1981 with G. J. DeSorcy, P.Eng., C. J. Goodman, P.Eng., and V. E. Bohme, P.Eng., sitting.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives Abbreviations used in Report	Witnesses
Hudson's Bay Oil and Gas Company Limited (HBOG) C. K. Yates	Dr. G. J. Besserer, P.Eng. R. E. Estep, P.Eng. W. P. Marika, P.Eng. A. Smandych, P.Eng. E. L. Wahl, P.Eng. L. R. Wessman, P.Eng.
Amoco Canada Petroleum Company Ltd. (Amoco) F. B. Matthews, P.Eng.	

cont'd THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Petro-Canada Exploration Inc. (Petro-Canada)	C. K. Sim, P.Eng.
Pembina Pipe Line Ltd. (Pembina) D. B. Reesor	D. B. Reesor
Texaco Canada Resources Ltd. (Texaco) S. A. Murray	
Alberta Environment staff C. S. Liu, P.Eng.	
Energy Resources Conservation Board staff D. A. Hogate E. P. Moeller, C.E.T. M. McCormick	

Gulf Canada Resources Inc. and the Town of Drayton Valley filed interventions but did not appear at the hearing.

2 INTERVENTIONS

Petro-Canada, intervened to state that although it had withdrawn an application for a proposed gas plant nearby, it would require gas processing capacity in the future. None of the other interveners presented evidence. Pembina cross-examined HBOG with respect to its proposal to transport liquid production from the plant site via the Elk River pipeline. However, HBOG clarified for the record that it would utilize whatever pipeline was approved after the Board had heard applications by other companies for alternative systems.

3 CONSIDERATION OF THE APPLICATION

The Board has considered the evidence with respect to the need for a plant in the area; the technical and conservation aspects of the plant; and its environmental, social, and economic impact on the area and the province; and finds that the proposed plant is in the public interest. The Board notes from the applicant's evidence that it advised other companies and the few people living in the area of its plans regarding the proposed plant. None of the local people appeared at the Drayton Valley hearing.

4 DECISION

The Board, being satisfied that HBOG has provided adequate information on the need for the plant, the location, technical and conservation aspects, social and economic impact, and environmental matters, granted HBOG's application immediately following the hearing. Subject to receipt of the necessary approval from the Minister of the Environment, with respect to environmental matters, the Board will issue the required approval for construction.

DATED at Calgary, Alberta on 23 December 1981.

ENERGY RESOURCES CONSERVATION BOARD

GJ DeSorcy

G. J. DeSorcy, P.Eng.
Vice Chairman

C. J. Goodman

C. J. Goodman, P.Eng.
Board Member

VE Bohme

V. E. Bohme, P.Eng.
Board Member

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